



# Sailor

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**INSTRUKTIONSBOG FOR  
SAILOR DC POWER SUPPLY N1411**

**INSTRUCTION BOOK FOR  
SAILOR DC POWER SUPPLY N1411**

**INSTRUKTIONSBUCH FÜR  
SAILOR DC POWER SUPPLY N1411**

**INSTRUCTIONS POUR  
SAILOR DC POWER SUPPLY N1411**

**INSTRUCCIONES PARA  
SAILOR DC POWER SUPPLY N1411**



**A/S S. P. RADIO · AALBORG · DENMARK**

**OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS! OBS!**

#### Vedrørende strømforsyningerne N1410 & N1411

Disse strømforsyninger er ved forsendelse fastspændt på træpallen med 4 brædebolte isat de normale opspændingshuller, som sidder under det grønne svøb.

Se venligst afsnit 4. MECHANICAL DISASSEMBLING i instruktionsbogen for N1410/N1411.

Det grønne svøb aftages ved at afmontere de 4 skruer på fronten, som vender opad under forsendelse. Derefter løftes det grønne svøb af, løft først i bunden (der, hvor ledningsindføringen er).

Vær opmærksom på, at kabel til blæser ikke er monteret fra fabrikken. Det skal monteres, når strømforsyningen er færdiginstalleret.

#### Concerning Power Supplies N1410 & N1411

In transit these power supplies are clamped to the wooden pallet by means of 4 carriage bolts fixed into the normal fixing holes, situated under the green cover.

Please see the section 4. MECHANICAL DISASSEMBLING in the instruction book for N1410/N1411.

The green cover is removed by unscrewing the 4 screws on the front turning upwards in transit. Then the green cover is taken off (start lifting from the bottom, where the cable lead-in is situated).

Please note that the cable for the blower is not mounted from the factory, but must be mounted when the installation of the power supply has been completed.

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- 1.1. GENERAL DESCRIPTION
- 1.2. TECHNICAL DATA
- 1.3. PRINCIPLE OF OPERATION



# 1. INTRODUCTION

## 1.1. GENERAL DESCRIPTION

SAILOR N1411 is a DC power supply intended to supply the SAILOR SSB programme 1000/B short wave transmitter when the set has to be supplied from a 24V battery.

SAILOR N1411 consists of two equal power sections working in parallel. All controls of the power supply come from the short wave station and take place via electrical wires.

SAILOR N1411 performs high reliability because of the double power section. If one power section should fail, the other power section continues to deliver power to the short wave station, however with reduced transmitter output power.

SAILOR N1411 can be combined with the AC power supply N1410 direct, thus forming an automatic change-over from AC to DC supply.

SAILOR N1411 can be connected to a switch and the operator can select whether the transmitter has to be supplied from the DC power supply, the AC power supply or automatic change-over from AC to DC power supply.

## 1.2. TECHNICAL DATA

The power supply N1411 delivers all necessary voltages to the SAILOR 1000/B SSB short wave set with an output power of 1000W PEP.

<u>Input Voltage:</u>	Nominal voltage 24V DC Extreme voltage 21.6 - 31.2V
<u>Input Current:</u>	by 26.4V DC input: 2-tone approx. 60A A3J approx. 34A A3H approx. 48A RX only approx. 5A

<u>Output Voltage:</u>	DC stabilized: 22V +-2% I <sub>max</sub> 3.4A 28V +-2% I <sub>max</sub> 5.0A 38V +-2% I <sub>max</sub> 2x14A  DC unstabilized: -45V I <sub>max</sub> 0.15A "8V" I <sub>max</sub> 2.0A  AC unstabilized: $V_{\text{blower}} = V_{\text{im}} - 2 \times V_{\text{sat}}$ I <sub>max</sub> 3.0A frequency 60 Hz
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Operating Temperature Range: -15°C to +55°C

Weight: 32 kg

Dimensions in mm: H x W x D = 656 x 386 x 198

### 1.3. PRINCIPLE OF OPERATION

N1411 power supply consists of two identical power sections (PS1 and PS2) and a Change-Over unit. An AC power supply N1410 can also be connected to the Change-Over unit to perform an automatic change-over from DC to AC.

One power section consists of three power supplies.

#### POWER UNIT I

PU I is a 400 Hz DC converter, which delivers low power voltages for receiver, exciter and transmitter.

#### POWER UNIT II

PU II is also a 400 Hz push-pull converter, which delivers high power to the transmitter power amplifier.

#### BLOWER CONVERTER

The blower converter produces an AC voltage for the blowers.

PU I is working when the set is switched on.

PU II is only working when PU I is switched on and the transmitter is keyed.

N1411 is switched on/off by the switches in the H1238 rack system.

Maximum loads for the output voltages of one power section:

PU II	38V:	$I_{Lmax} = 14.0A$
	28V:	$I_{Lmax} = 5.0A$
PU I	22V:	$I_{Lmax} = 3.4A$
	"8V":	$I_{Lmax} = 2.0A$
	-45V:	$I_{Lmax} = 0.15A$

**Notice!** The output voltages are measured at the output of the Change-Over unit. The output voltages of the power section are approx. 0.8V higher because of the voltage drops over the diodes in the Change-Over unit.

It is necessary to have all outputs loaded with their max. load when the current limiter is adjusted.

To ensure proper regulation it is necessary that the power supply has a minimum load.

PU I: min. load for 22V output is approx. 22 ohm (no load at "8V" and at -45V output).

PU II: min. load to 38V output is approx. 50 ohm (no load at 28V output).

An "Internal Blower" is placed in the bottom of the cover to cool the power supply. If the temperature of one of the power sections exceeds 70°C a thermal breaker TB503 closes and connects the blower to the battery supply. It only switches off the blower when the temperature is below 55°C, even if the power supply is switched off.

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- 2. INSTALLATION (HINTS)
- 2.1. DIMENSIONS AND DRILLING PLAN
- 2.2. ELECTRICAL CONNECTIONS



## 2. INSTALLATION (HINTS)

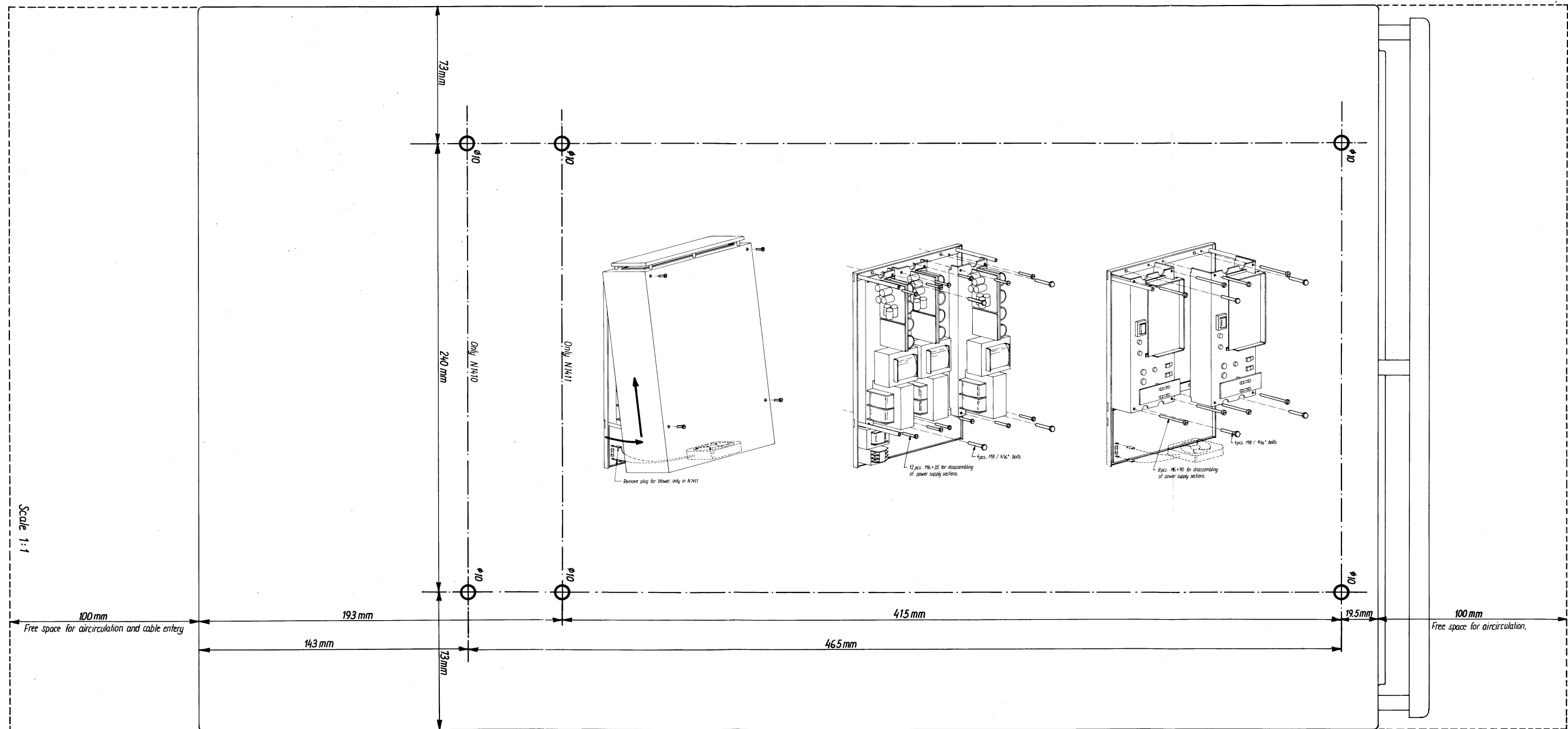
The power supply has to be installed vertically because it is convection cooled.

To ensure free air flow inside the power supply it is necessary with free space of at least 15 cm at the top and at the bottom of the cover.

In order to facilitate the installation dismantle the power supply sections (see the MECHANICAL DISASSEMBLING). Then install the back plate with the printed circuit board and after that install the power sections on the back plate one by one.

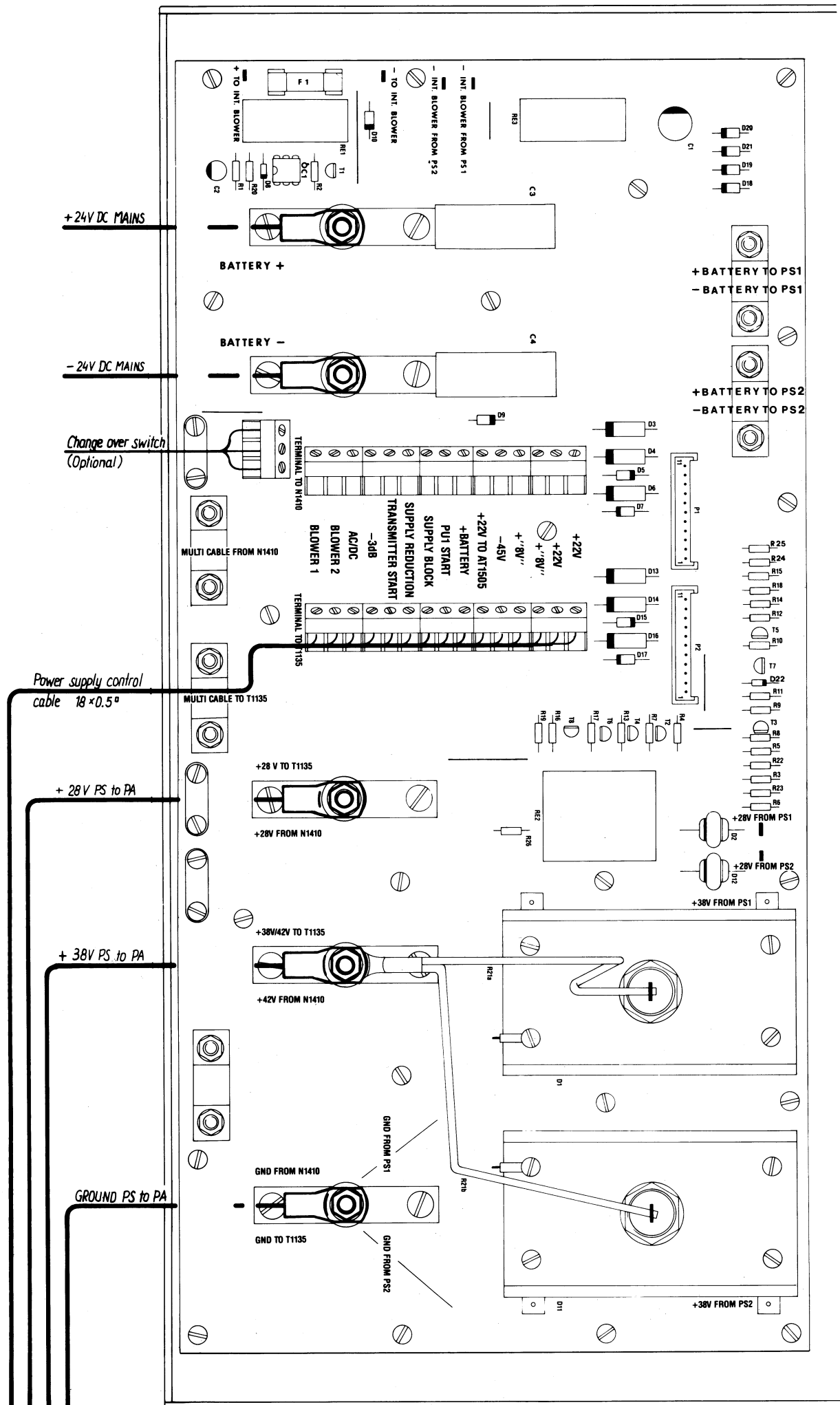
When all the cables are connected, execute the Performance Check (see the section SERVICE).

## 2.1. DIMENSIONS AND DRILLING PLAN



DIMENSIONS AND DRILLING PLAN

## 2.2 ELECTRICAL CONNECTIONS



N1411  
4-6-24993 9-0-24993D

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- 3. SERVICE
- 3.1. MAINTENANCE
- 3.2. RECOMMENDED TEST EQUIPMENT
- 3.3. TROUBLE SHOOTING
- 3.4. PERFORMANCE CHECK
- 3.5. NECESSARY ADJUSTMENTS AFTER REPAIR
- 3.6. PIN CONFIGURATIONS



### 3. SERVICE

#### 3.1. MAINTENANCE

When the SAILOR short wave set programme 1000/B has been correctly installed, the maintenance of the power supply can, dependent on the environments and working hours, be reduced to a performance check at the service workshop at intervals not exceeding 5 years.

A performance check list is enclosed in the PERFORMANCE CHECK section.

Also inspect cables and plugs for mechanical defects and corrosion.

Any repair of the set should be followed by a check described in the section NECESSARY ADJUSTMENTS AFTER REPAIR.

#### 3.2. RECOMMENDED TEST EQUIPMENT

Multimeter .....	Philips PM2505
Oscilloscope .....	Philips PM3214

### 3.3. TROUBLE SHOOTING

#### Failure in Power Unit I

1. Bad connections in plugs.
2. Fuse F401 is blown out.
  - a. The converter transistors T501 and T502 or the output stage in the blower converter are short-circuited.
3. PU I will not start up.
  - a. Check the relay RE201 and the voltage to it.
4. The converter starts up, but the output voltages are wrong.
  - a. Check the outputs severally.

#### Failure in Power Unit II

1. Relay RE202 is not activated when handset key is pressed.
  - a. PU I is out of function.
  - b. Handset key is out of function.
2. Supply is blocked.
  - a. Temperature protection unit in T1135 blocks the power supply because of overheating of the transistors in the power amplifier in the transmitter.  
Check also the blowers and air filter.
  - b. The thermal breaker TB501 has opened because the temperature has exceeded 100°C in the power section. Check the internal blower in the cover or the supply reduction circuit.
  - c. Bad connection of J101.
  - d. Over- or under voltage shut-down at IC201.
3. Supply starts up, but goes into "hiccup mode".
  - a. Wrong adjustment of current limiter R243.
  - b. Output voltage is short-circuited or overloaded.
  - c. Too low input voltage.
4. Supply starts up but the output voltages are wrong.
  - a. 28V output is missing.  
Check the temperature or the thermal breaker TB502.
  - b. 28V output is too high because of wrong adjustment of R271 or the transistor T510 is short-circuited.
  - c. 38V output is reduced.  
Check the temperature of the power section (TB502) or of the transmitter.  
Check also the supply reduction circuit.

### 3.3. TROUBLE SHOOTING cont.

#### Failure in the Blower Converter

1. Blowers will not stop.
  - a. Too high temperature in the power supply.
  - b. Too high temperature in the transmitter.
  - c. Bad connection in J101.
  - d. Transistor T302 is short-circuited.
  - e. Dirty air filter.
2. Blowers will not run.
  - a. ON/OFF circuit consisting of OC301, T301 and T302 is out of function.
  - b. Wrong frequency of IC301.
  - c. Wrong pulse time of IC303.
  - d. The change-over circuit in the Change-Over unit is out of function.

#### Failure in the Change-Over Unit

1. The 38V output is reduced (supply reduction circuit is activated).
  - a. Transmitter is overheated.
  - b. A power section is overheated.
  - c. A 28V output or a 38V output or a whole power section is out of function.
  - d. One of the transistors except T1 on the change-over unit is out of function.
2. The N1410 is connected to the Change-Over unit, but it cannot switch over to the AC power supply.
  - a. N1410 is out of function.
  - b. The link at terminal ST3 is missing or the switch (option) to terminal ST3 is in wrong position.
  - c. The relay RE2 is defective.
  - d. The circuit around the opto coupler OC1 is out of function.

### 3.4. PERFORMANCE CHECK

1. Remove the cover from N1411. Take care of the wire to the "internal blower" in the bottom of the cover.
2. Connect N1411 to the transmitter T1135 and to 24V DC.
3. Push the "ON" button on the transmitter rack. Now the power supply N1411 is switched on.
4. Select a frequency and tune the transmitter.
5. Reduce transmitter output power with the reduce button on the front panel of the exciter S13XX.
6. Remove the connector J101 (cable from power section 2) from the Change-Over unit. Only power section 1 is now working.
7. Remove the "-3 dB" wire from the terminal ST2 on the Change-Over unit to prevent reduction of 38V when measuring it. The wire comes from T1135 in the multicable.
8. Press the handset key.
9. Check the output voltages from the Change-Over unit.

22V	output is approx. 22.2V
"8V"	output is approx. 12.8V
-45V	output is approx. 40.5V
28V	output is approx. 28.2V
38V	output is approx. 38.5V
10. If necessary then adjust.
11. Check if the blowers in T1135 are running.
12. Replace the connector J101 to the Change-Over unit.
13. Remove the connector J101 (cable from power section 1) from the Change-Over unit. Only power section 2 is now working.
14. Check again the output voltages from the Change-Over unit.
15. It is important that the 22V, the 28V and the 38V output voltage from power section 2 have exactly the same value as the output voltage from power section 1 because they share the output current. If necessary then adjust as close as possible.
16. Check if the blowers in T1135 are still running.
17. Release the handset key.
18. Replace the "-3 dB" wire from T1135 to the terminal ST2.
19. Press the handset key again.
20. Check that the 38V output voltage is reduced to approx. 30V.



#### 3.4. PERFORMANCE CHECK cont.

21. Replace the connector J101 (cable from power section 1) to the Change-Over unit. Check that the 38V output is no longer reduced.
22. Turn the full power on again.
23. The current limiter cannot be adjusted in this condition. If the current limiter has to be adjusted, please see the section 3.5. NECESSARY ADJUSTMENT AFTER REPAIR.
24. Check the "internal blower" in the cover of N1411 by short-circuiting the thermal breaker TB503 in the power sections.
25. Turn off the set.

### 3.5. NECESSARY ADJUSTMENTS AFTER REPAIR (for one power section without Change-Over unit)

#### POWER UNIT I

1. Connect selfmade test load to the outputs of the power section.
2. Remove fuse F402.
3. Connect 24V DC to the input terminal.
4. Switch on PU I with minimum load on the 22V output to ensure starting-up.
5. Adjust 22V output with R238 to 22.5V with full load.
6. Check "8V" output to approx. 13V.
7. Check -45V output (approx. -40V).
8. Switch off PU I.

#### POWER UNIT II

When PU II is switched on and if the power section has to run for more than a few minutes, it is always necessary to cool the switch transistors T504 and T505 and the output rectifier D505. It is recommended to mount the power section vertically or to cool it with a blower.

1. Remove the connection wire from the collectors of T504 and T505 to the transformer TR502.
2. Switch on PU I and check the output voltage of PU I.
3. Connect scope ground to negative input voltage (negative pole of C503) and scope probe to the base of T504.
4. Replace F402.
5. Switch on PU I and PU II and check the base driver (see fig. on diagram).
6. Check also the base driver of T505 by connecting scope probe to the base of T505.
7. Switch off PU I and PU II.
8. Reconnect the transformer TR502 to the collectors of T504 and T505.
9. Switch on PU I and PU II.
10. Turn R243 out of current limiting.  
Adjust 38V output with R259 to 38.8V with a load of 5A at the 38V output.  
Adjust 28V output with R271 to 28.5V with a load of 2A at the 28V output.  
Adjust current limiter with R243 so the 38V output is 35.5V with full load at 38V and at 28V output.

To ensure that two power sections are working in parallel and sharing the output current, it is absolutely necessary that both power sections are adjusted to exactly the same output voltage.

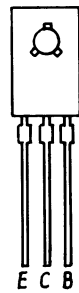
### 3.5. NECESSARY ADJUSTMENTS AFTER REPAIR cont.

#### BLOWER CONVERTER

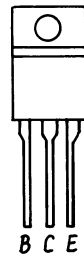
1. Switch on PU I and PU II. The blowers must be running.
2. Connect scope ground to the negative pole of the input voltage and scope probe to IC302 pin 1 (or pin 2). Adjust with R305 so that the frequency is 60 Hz (16.67 ms).
3. Connect scope probe to IC303 pin 3. Adjust with R311 so that the pulse time is 7.5 ms.

### 3.6. PIN CONFIGURATION

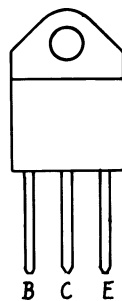
**FRONT VIEW**



**BD 138**

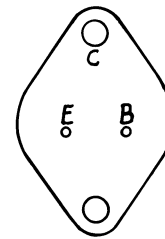


**BD 649  
BD 650  
BDX 34 B**



**BUW 49**

**BOTTOM VIEW**



**M1802  
BUV 19**



**BC 338  
BC 548**



**BC 639  
BC 640**

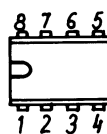


**MPS-A06**

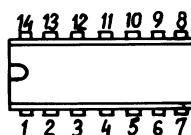


**MC 78L08 ACP**

**TOP VIEW**

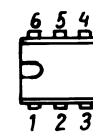


**MC 1455 P1  
LM 358 N**

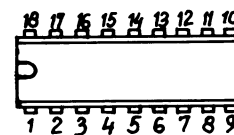


**MC 1723 CP  
MC 14013 BCP**

**TOP VIEW**



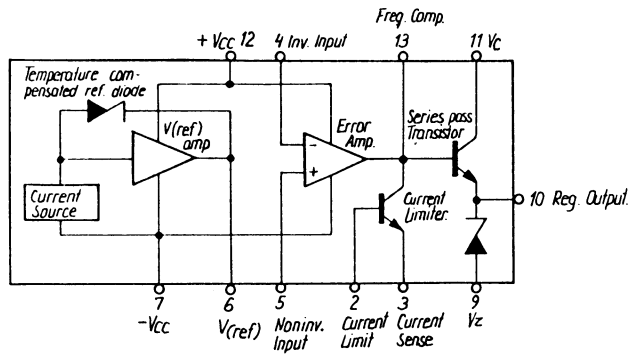
**CNY 17-2**



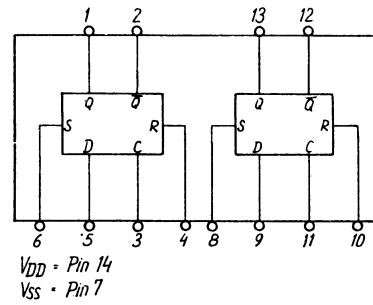
**TDA 4718 A**



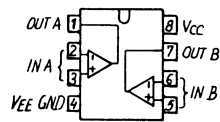
### MC1723



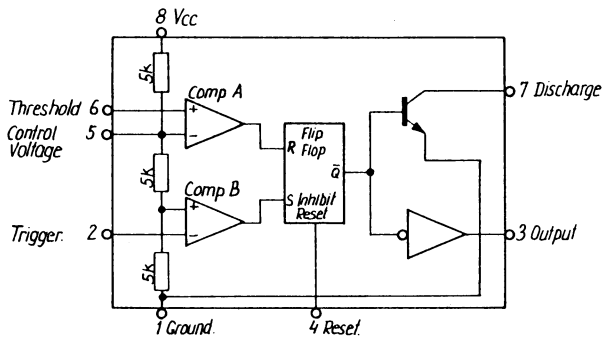
### MC14013 B



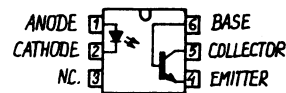
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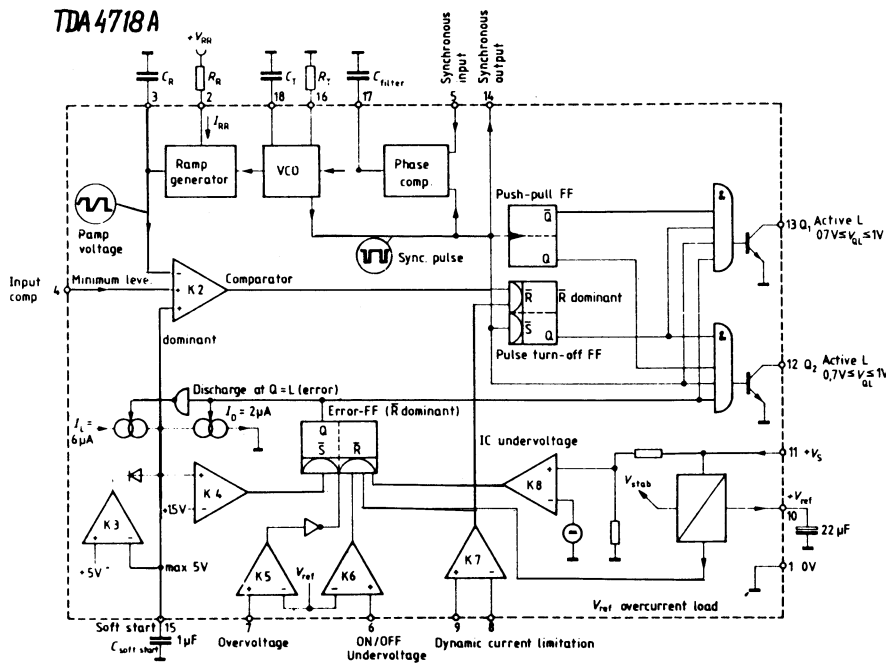
### MC1455 P1



### CNY17-2



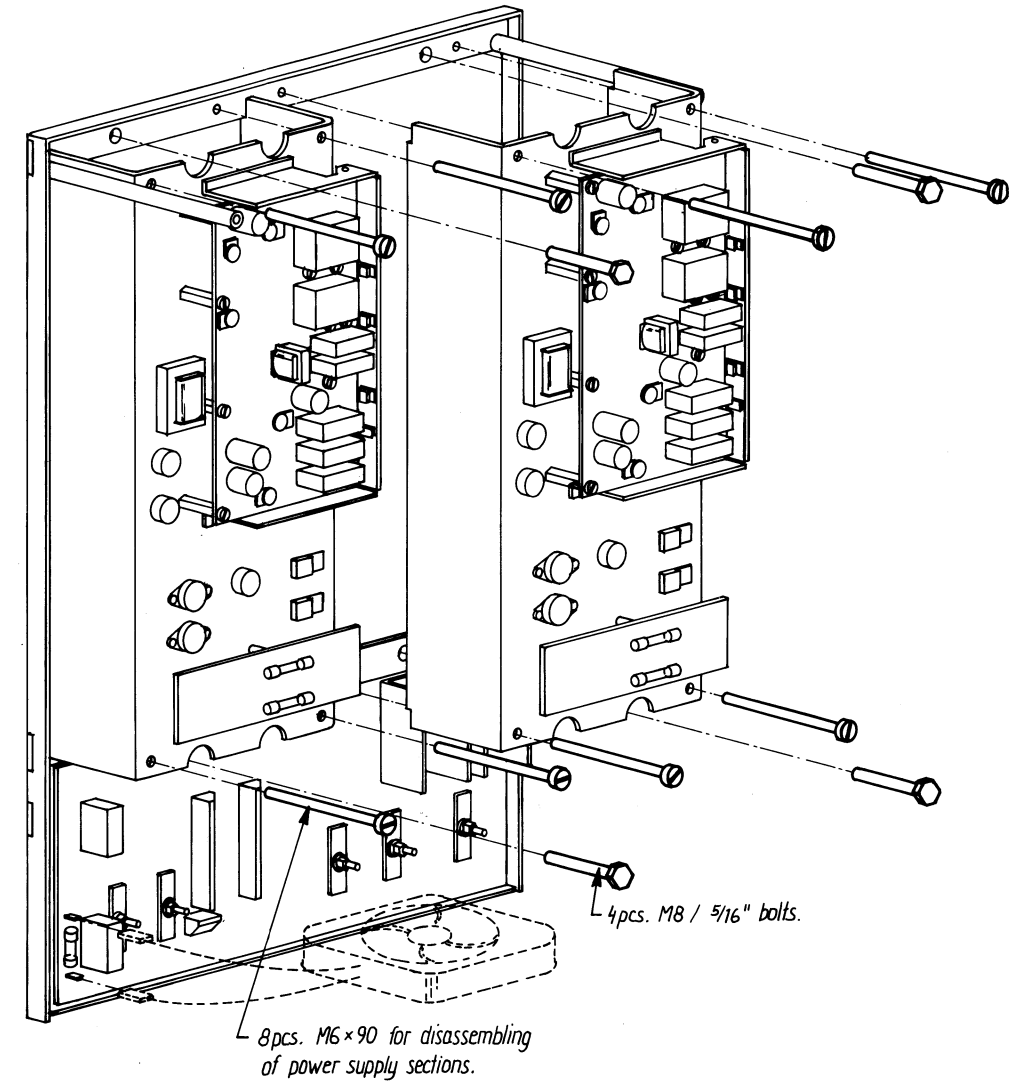
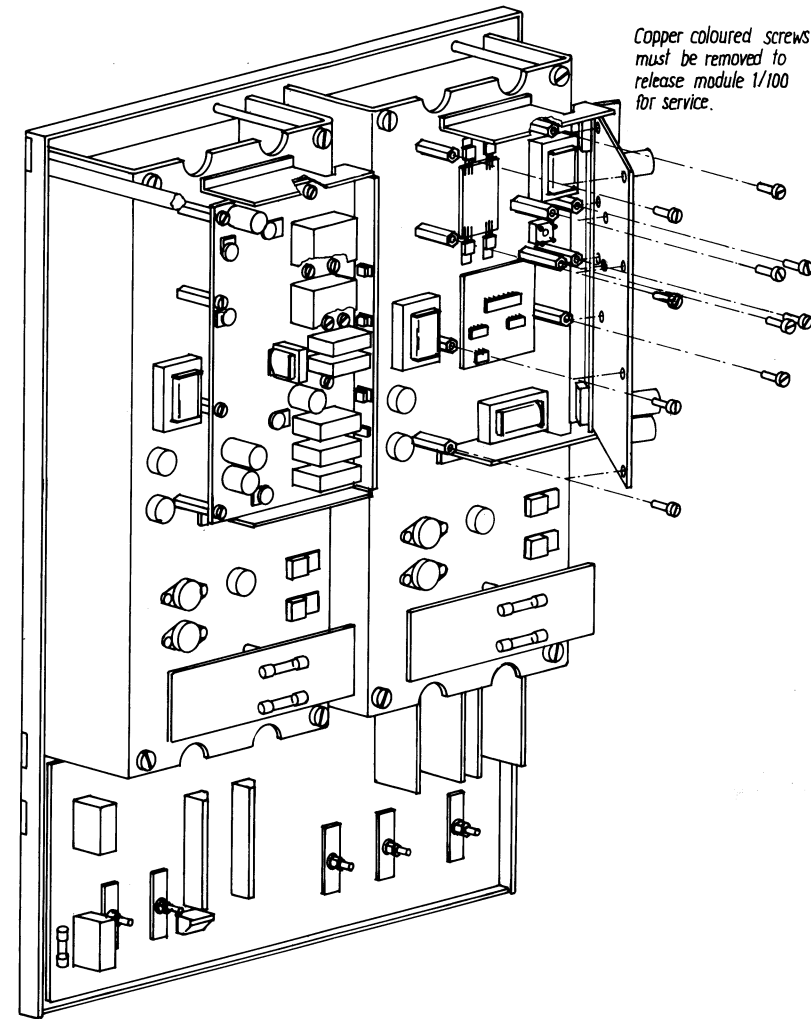
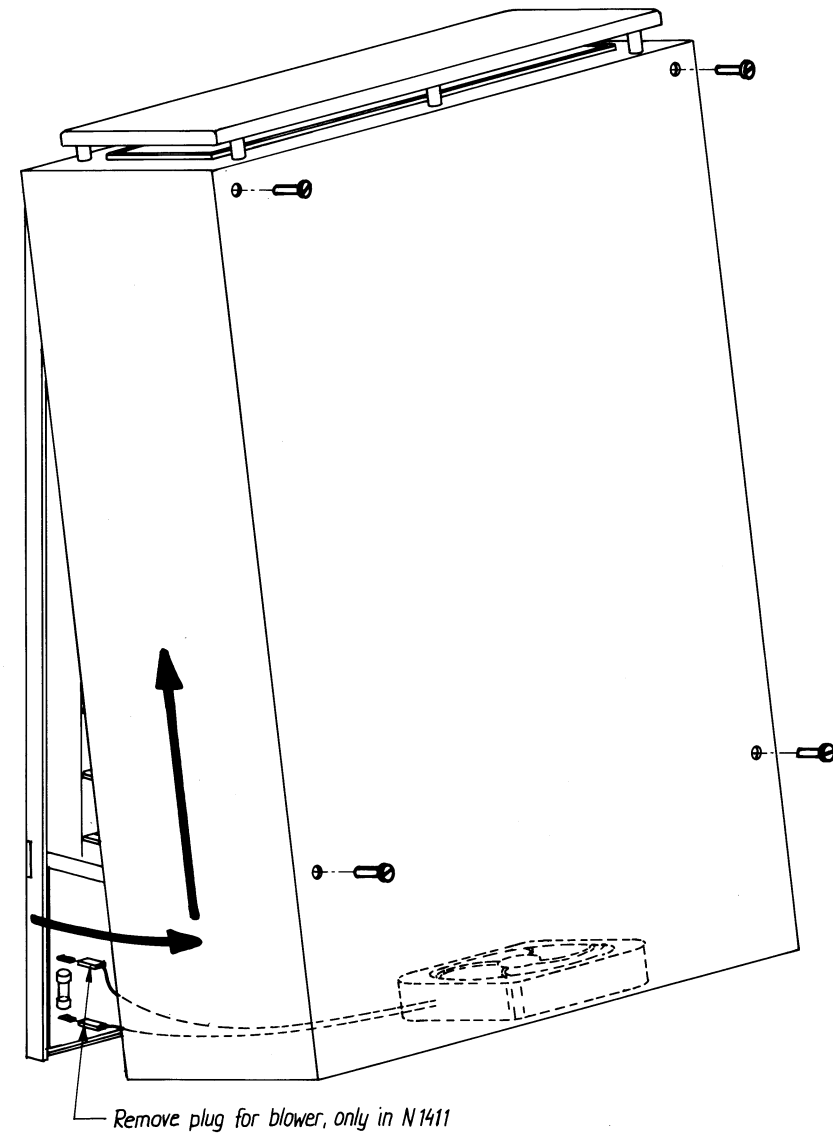
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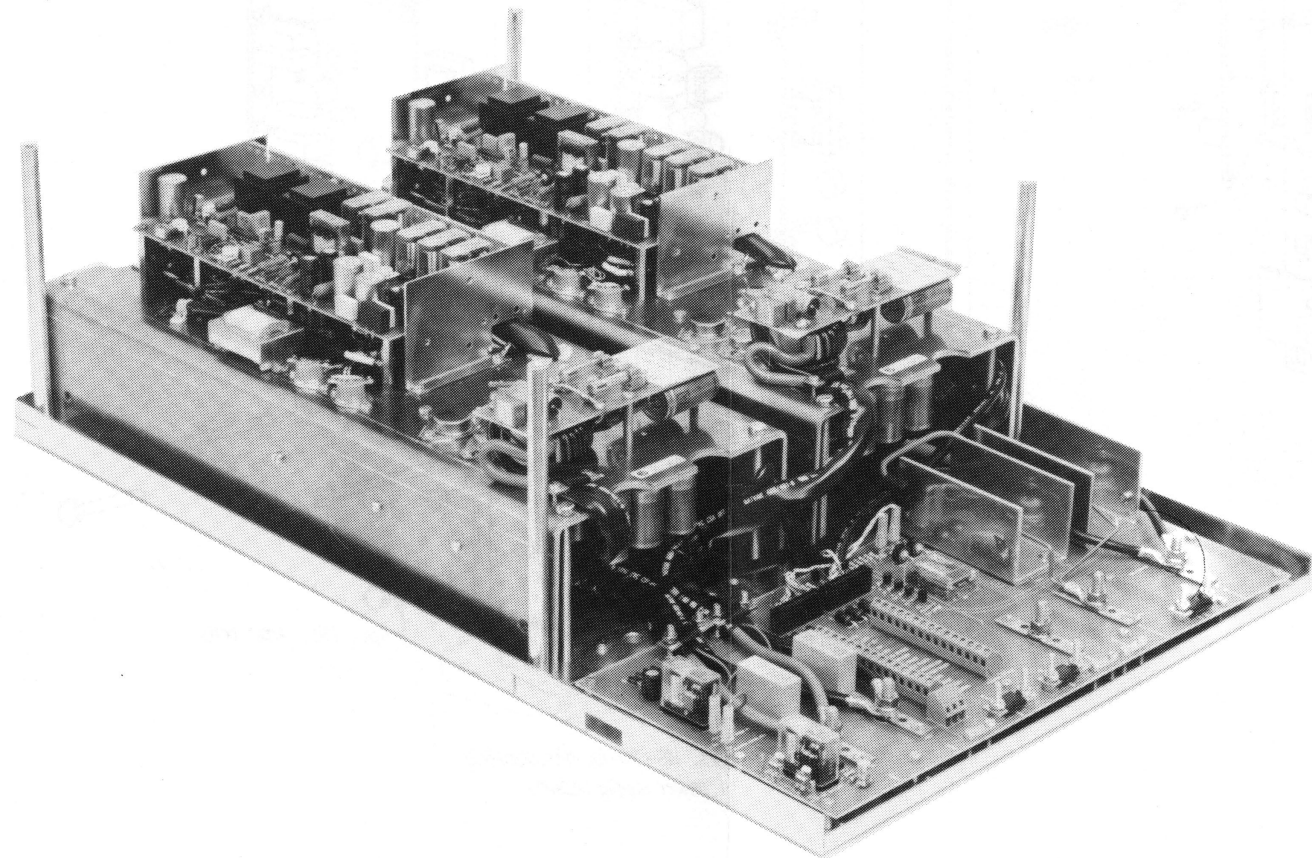


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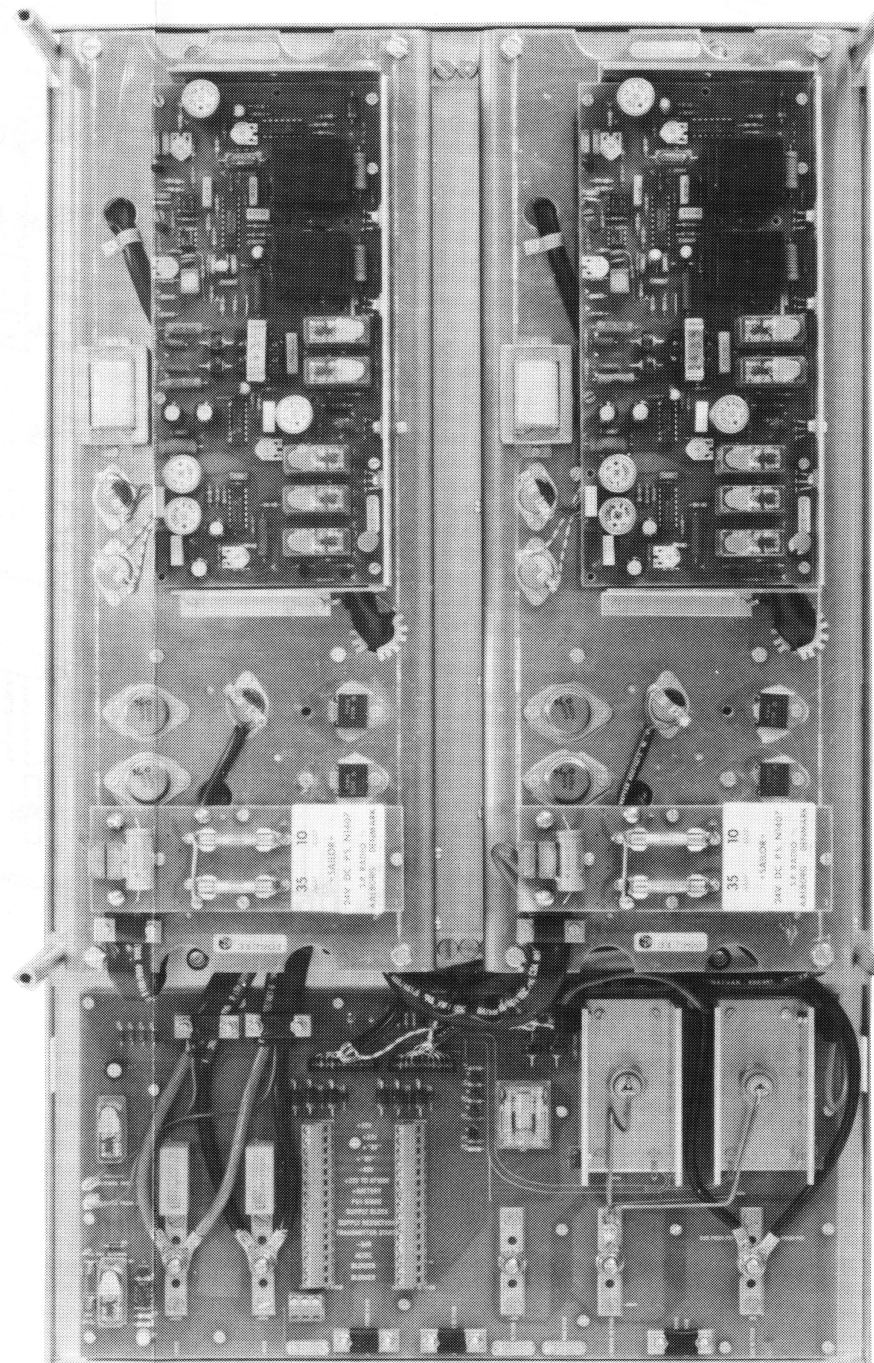
### 4. MECHANICAL DISASSEMBLING

# 4. MECHANICAL DISASSEMBLING

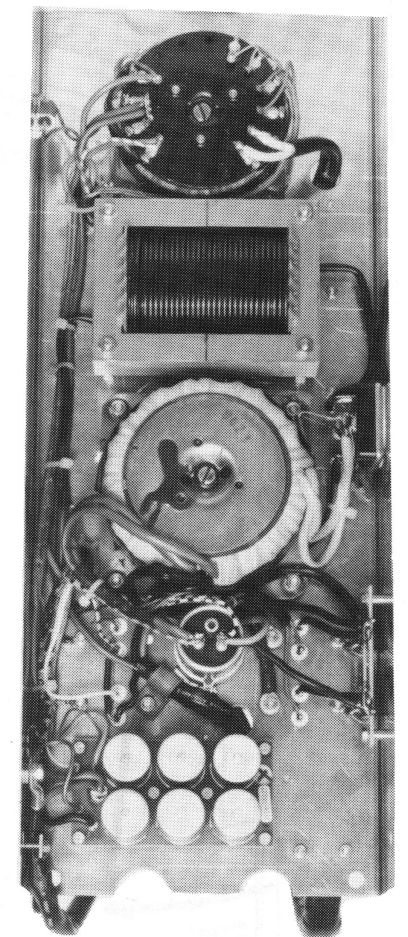




N1411 TOP VIEW



REAR VIEW OF POWER SUPPLY SECTION



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FOR N1411 (MODULE 6/600)
  - 5.7. CHANGE-OVER UNIT (MODULE 7/700)  
SEE DIAGRAM UNDER ITEM 5.6.

## 5. CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS

Power section PS1 and PS2 are two identical power supply sections connected in parallel, therefore only one of them is described (module 100, 200, 300, 400 and 5 in N1411).

### 5.1. CAPACITOR UNIT (MODULE 1/100)

The 38V output voltage is smoothed by the capacitors C101 - C106. The wire of constantan is the sense resistor R101. It senses the output current in order to limit the output current.

### 5.2. POWER UNIT I AND POWER UNIT II (MODULE 2/200)

#### POWER UNIT I

In the rack system H1238, the terminals +BATTERY and PU I START are short-circuited and relay RE201 is activated when starting-up the PU I. The converter, consisting of TR201, TR501, T501, and T502, starts up and delivers the voltages to the three secondary outputs.

-45V output is only rectified by D205 and is not regulated. The voltage is -34V to -54V depending on the input voltage.

"8V" output is only rectified by D502 and is not regulated. The output voltage is 11V to 16V depending on the input voltage.

22V output is regulated after the switch mode principle by IC202 and is adjusted with R238. Transistor T203 turns on and the current flows through L501 and L502 to the load. The voltage increases at pin 4 on IC202, which turns off T203. The current flows continuously in L501 to the load and back through D210. The voltage decreases at pin 4 and IC202 turns on T203 again. The regulator is then self-oscillating. R233 forms a current limiter but cannot protect against a short-circuit to the output.

#### POWER UNIT II

When the transmitter is keyed, the relay RE202 switches on. The aerial coupler AT1505 gets 22V supply via J101 pin 8. The voltage at IC201 pin 6 and pin 7 is determined by R204, R205, and R206. These inputs form an over and under voltage protection. "Over voltage" shut down occurs at approx. 33.5V input. "Under voltage" shut down occurs at approx. 16.5V input.

Switching on PU II means that C207 can be charged by IC201 and create a soft start function at pin 15 to limit the peak current in the switch transistors and the output rectifier.

The IC201 has two outputs, pin 12 and pin 13, working as push-pull and being active low. The switch frequency is approx. 450 Hz, but the frequency of the internal sawtooth oscillator is approx. 900 Hz, determined by R207 and C206.

## 5.2. POWER UNIT I AND POWER UNIT II (MODULE 2/200) cont.

### 38V REGULATION

Regulation of the duty-cycle is done by varying the voltage at pin 4. This regulation signal to control the output current and output voltage is created in IC204.

Voltage supply for IC201 is regulated by means of R201 and D201.

The output voltage of 38V is regulated by IC204a. The reference voltage is made by D213. Adjustment is done with R259. If the output voltage increases, pin 1 will go low. Via OC201, IC201 pin 4 is pulled down and this reduces the duty-cycle and thus the output voltage. R266 has to be connected to ground to get 38V. For supply reduction to the transmitter, R266 is released from ground via the thermal protection unit in T1135 and the output voltage is approx. 30V.

The controlled square wave from the outputs of IC201 is led to the switch transistors T504 and T505 via the driver transistors T201 and T202 and the driver transformers TR202 and TR203. The diodes D206 - D209 clamp the over voltage transients from the driver transformers. The diodes D503 and D504 together with C501, R502, C502 and R503 protect the switch transistors against transients and unwanted oscillations. C503 reduces the ripple to the input filter.

### CURRENT LIMITER

A current limiter is performed by IC204b. R101 is the current sensor and is made of constantan wire. If the current exceeds the level determined by R243, the output pin 7 goes high and turns on T207, which again pulls down the reference voltage for IC204a. This means that the output voltage to the transmitter will be reduced.

The current limiter is made slow with C226 to prevent the variation from the modulation of the transmitter. It cannot protect the output transistors or rectifier against short-circuit of the output.

IC206 delivers a regulated 8V supply for the voltage regulator and current limiter circuit.

### 28V REGULATION

The 28V output is regulated by IC205 and is adjusted with R271. Transistor T208 turns on and the current flows through L504 to C231 and the load.

The voltage increases at pin 4 on IC205, which turns off T208. The current flows continuously on L504 to the load and back through D214. The voltage will decrease at pin 4 and IC205 turns on T208 again. The regulator is then self-oscillating. R268 forms a current limiter but cannot protect against a short-circuit to the output.

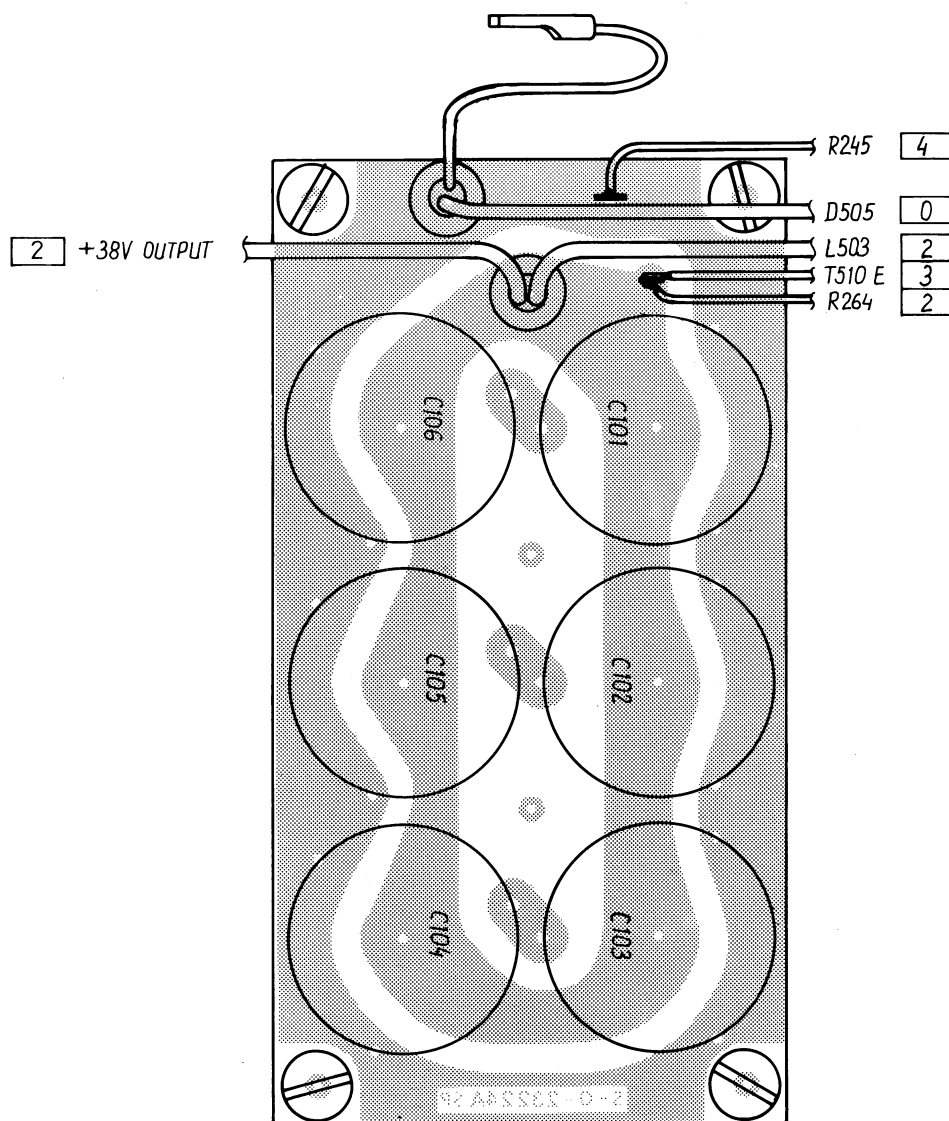
### TEMPERATURE PROTECTION

The thermal breaker TB502 breaks the 28V output to the Change-Over unit if the chassis temperature exceeds 90°C. This means that the monitor circuit in the Change-Over unit sends a signal to the transmitter (via the "-3 dB" wire), which sends a signal back to N1411 to reduce the 38V output voltage (via SUPPLY REDUCTION wire), until the temperature is below 75°C.

If the temperature is still increasing and exceeds 100°C, the thermal breaker TB501 breaks and PU II is blocked because there is no supply for the relay RE202.

The PU II is blocked until the temperature is below 75°C.

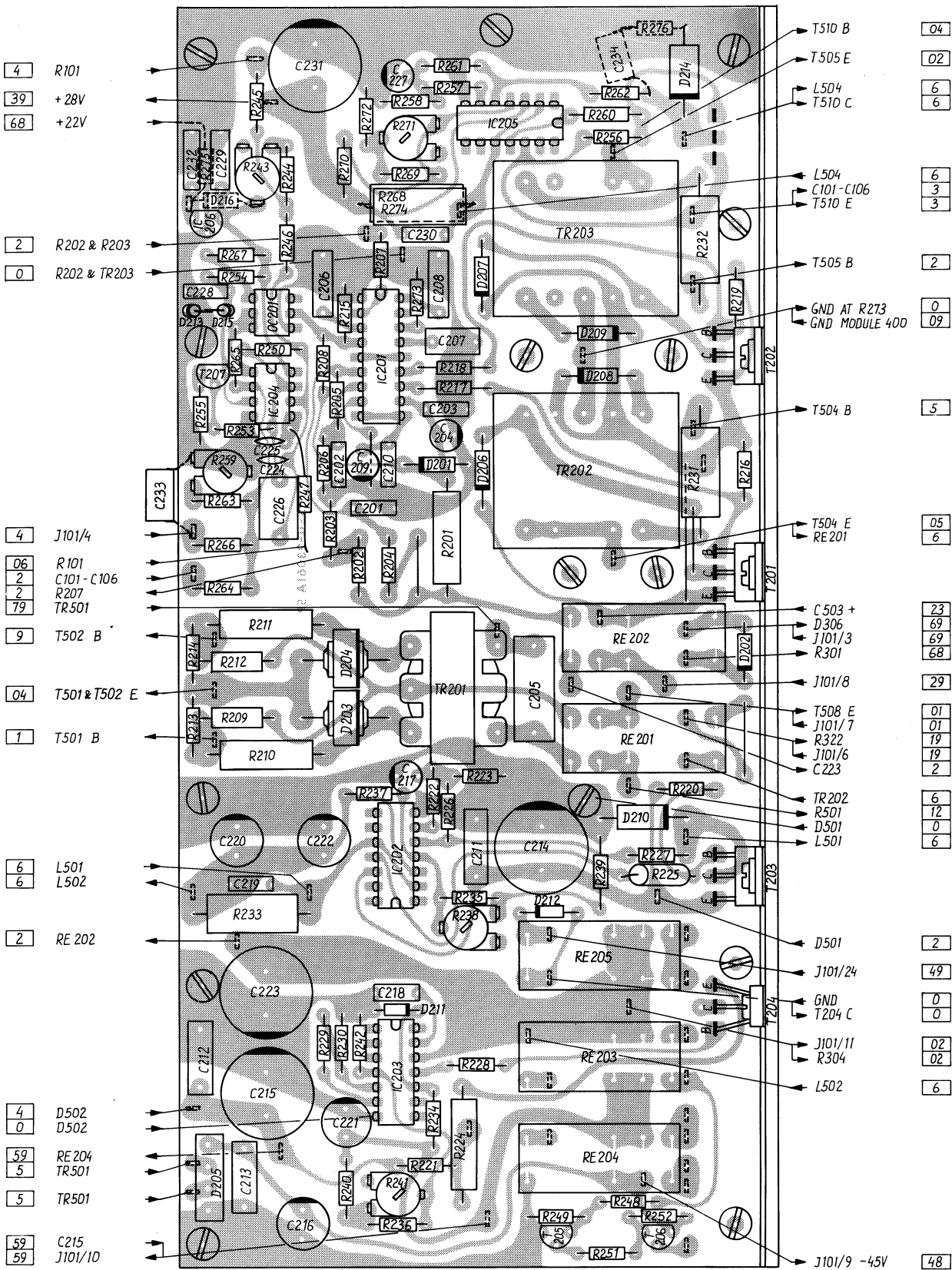
## 5.1 COMPONENT LOCATION (MODULE 1/100)



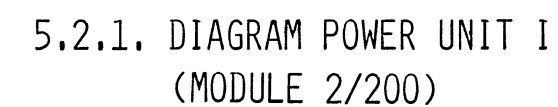
Seen from component side with lower side tracks

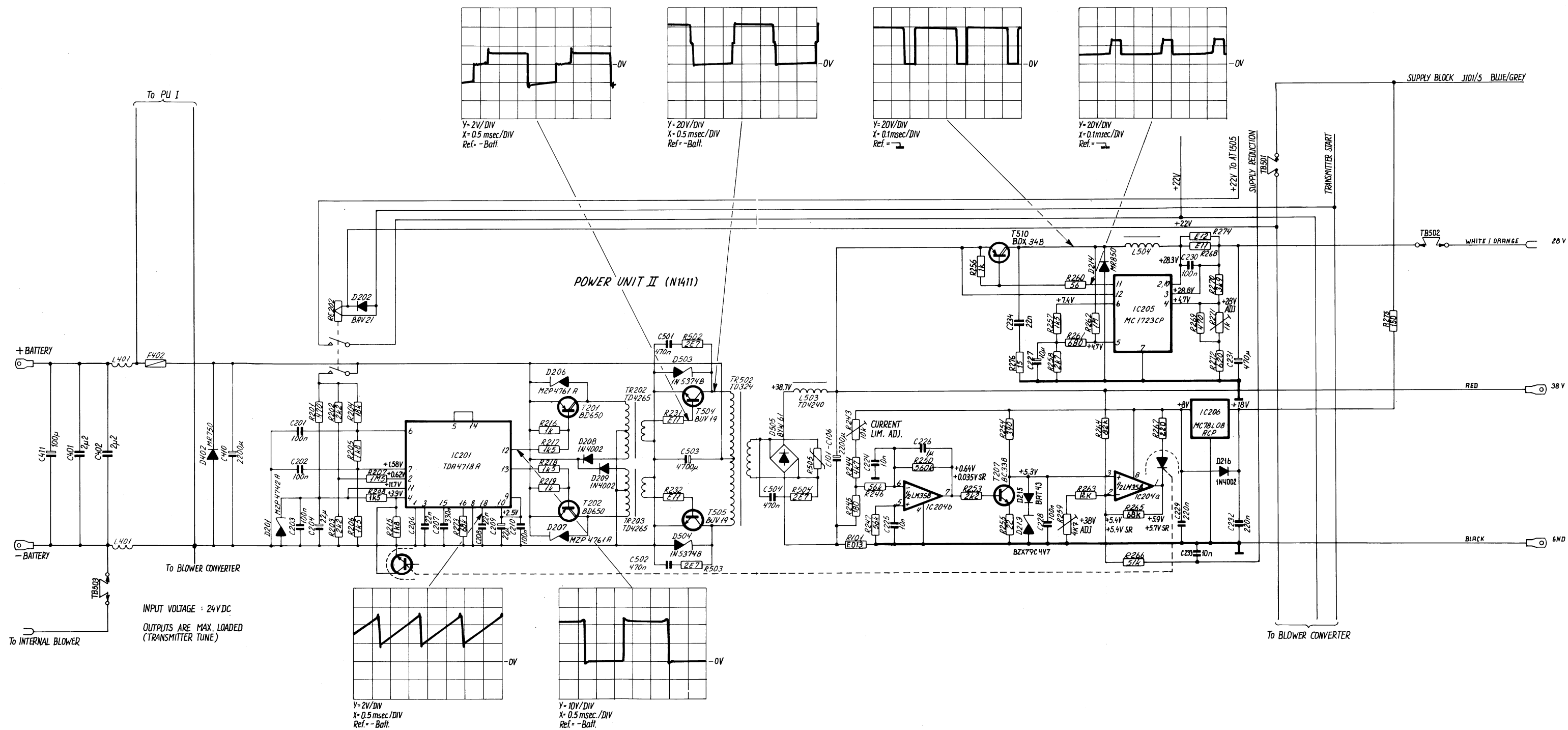


5.2 COMPONENT LOCATION POWER UNIT I & II (MODULE 2/200)



Seen from component side with lower side tracks





5.2.2. DIAGRAM POWER UNIT II (MODULE 2/200)

### 5.3. BLOWER CONVERTER (MODULE 3/300)

When PU I is started-up, the oscillator IC301 is always running. The output stage and also the blowers are switched on/off by means of OC301 and IC303.

The supply for the blower converter control circuit is regulated to 12V by means of R322 and D301.

The frequency of the oscillator IC301 is 120 Hz and is determined by means of IC301, C303, R305, R306 and R307. The frequency is adjusted with R305. The output pulses from IC301 pin 3 are led to IC303 pin 2 and to T303, which inverts the signal before it is led to IC302, which produces a square wave signal of 60 Hz to the output stage.

In order to avoid the simultaneous conducting of all four output transistors T506 - T509, a dead time is performed with IC303, which pulls down the base of T304 and T305 via D302 and D303. This will block the output stage.

If OC301 is not activated, IC303 pin 4 is grounded via R313 and the dead time is 100% and then the output stage is off. If IC303 pin 4 is pulled high via OC301, the output pulse from IC303 pin 3 is 7.5 ms, which is adjusted with R311 and the blowers are running.

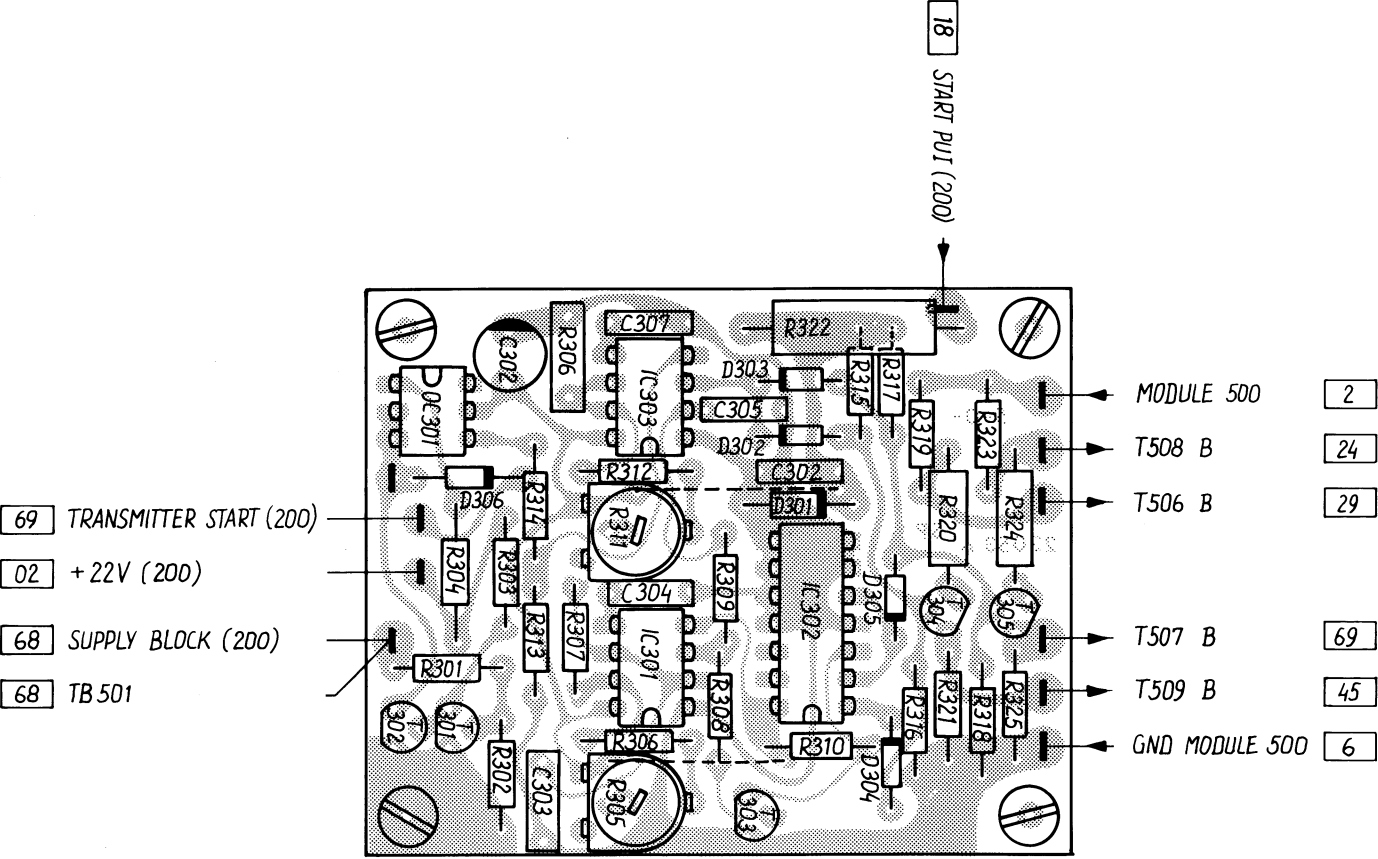
The output stage is a bridge coupled push-pull stage and consists of four Darlington power transistors T506 - T509 driven by the transistors T304 and T305.

OC301 is always biased with 22V from PU I. By means of OC301 the blowers can be switched on in two ways.

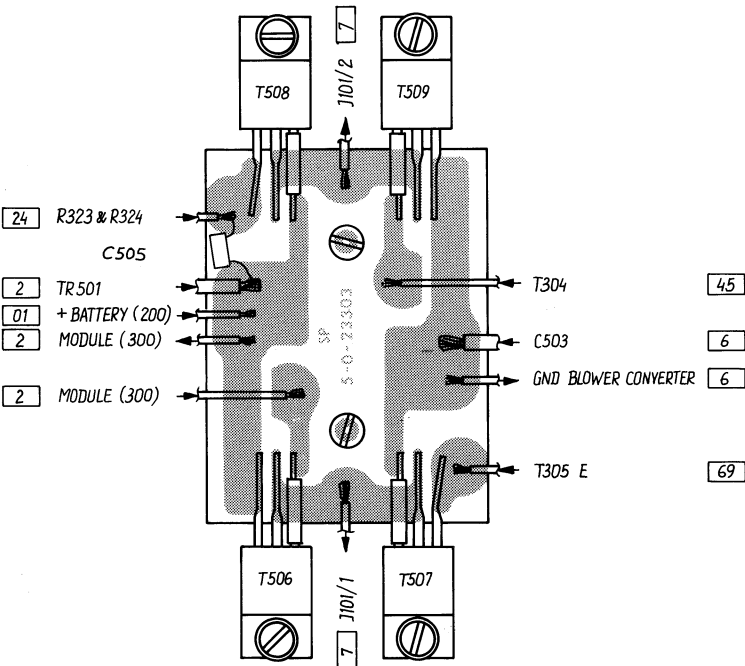
When transmitter is keyed, diode D306 is grounded via handset key and the blowers are running.

The temperature protection unit in the transmitter unit can break the connection between +22V and SUPPLY BLOCK terminal. This turns off T301 which again turns on OC301 and thus also the blowers.

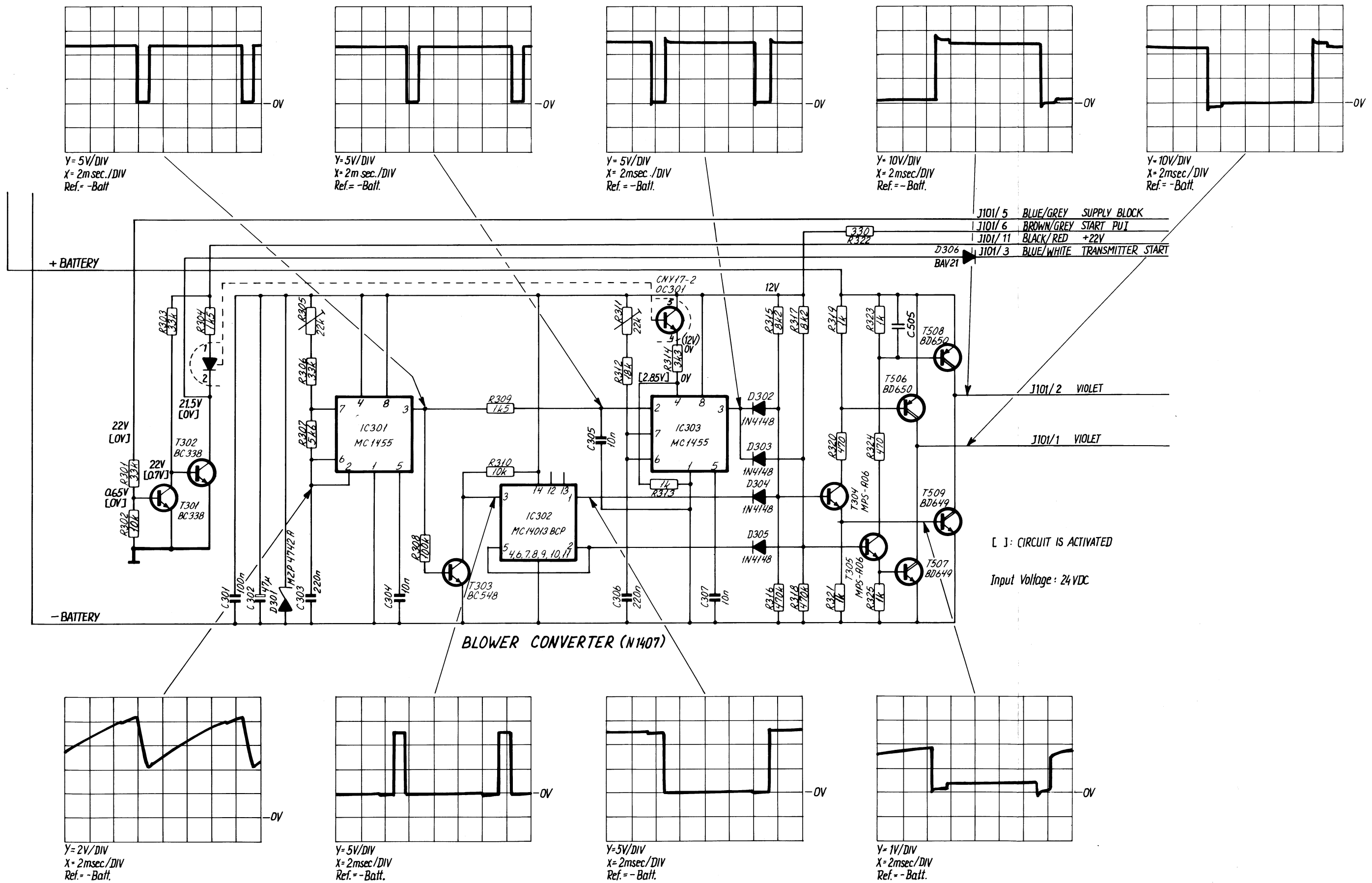
5.3 COMPONENT LOCATION BLOWER CONVERTER (MODULE 3/300)



Seen from component side with lower side tracks



Seen from component side with lower side tracks

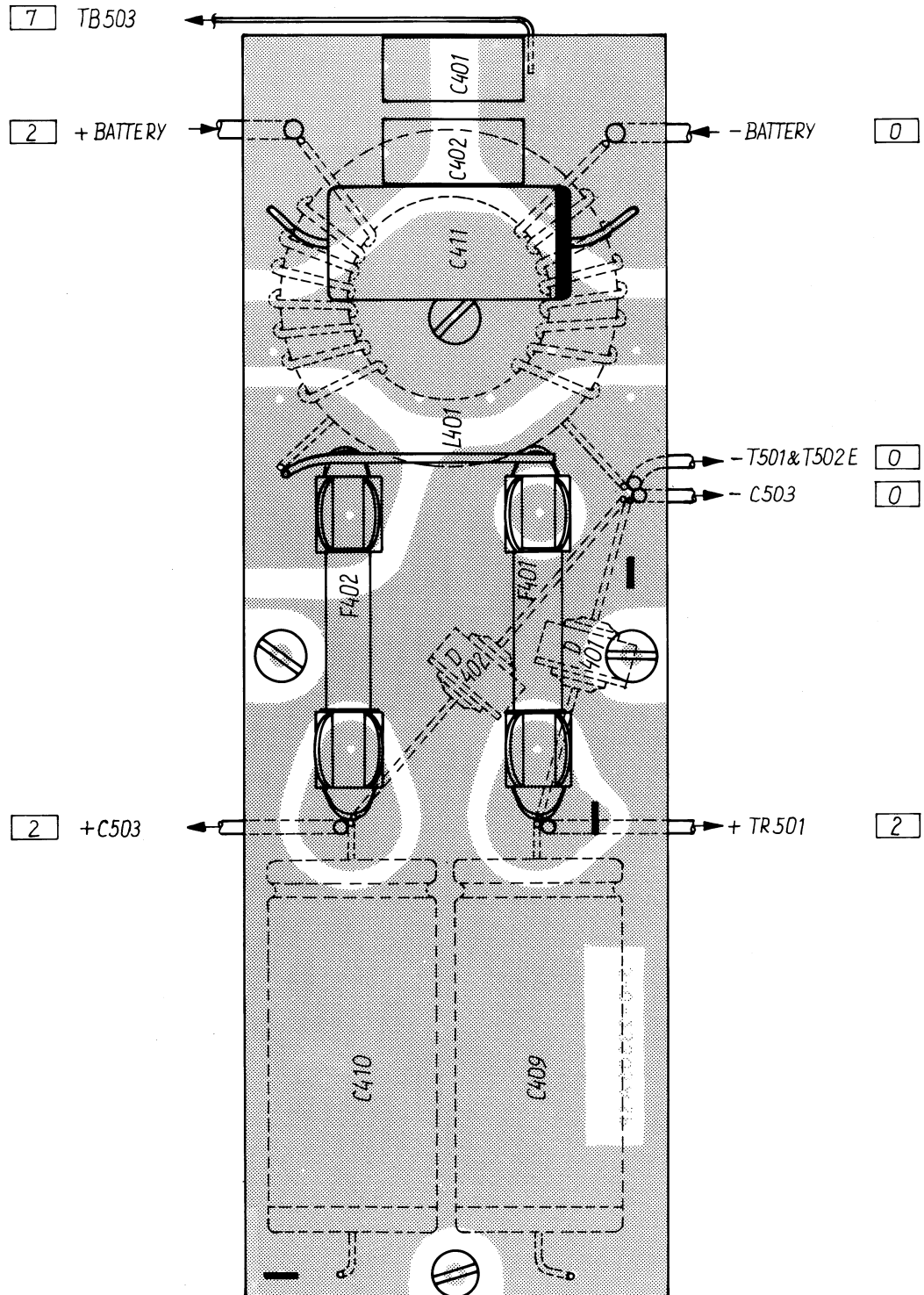


### 5.3.1. DIAGRAM BLOWER CONVERTER (MODULE 3/300)

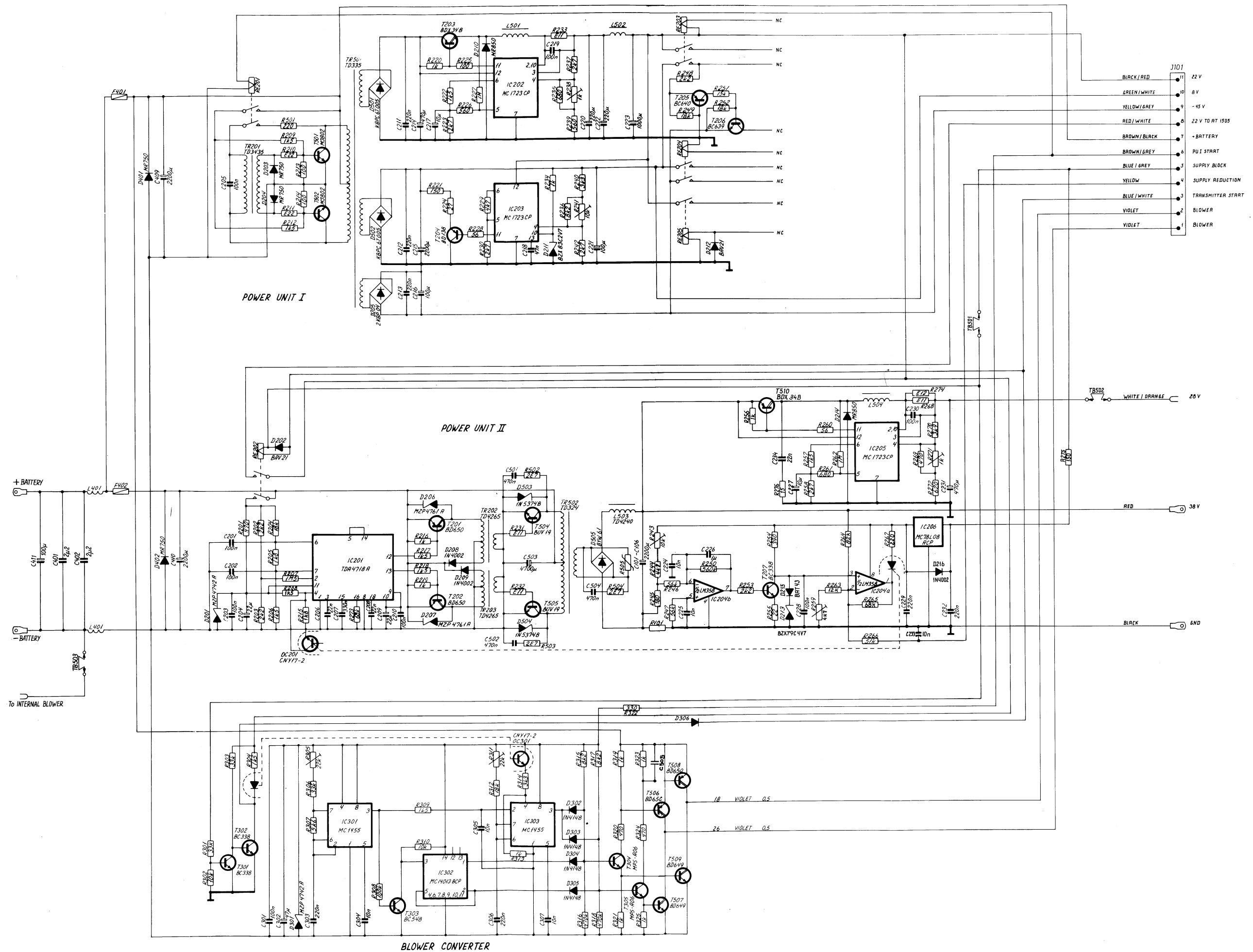
## 5.4. INPUT FILTER AND FUSES (MODULE 4/400)

The filter consists of capacitors and a filter choke L401 to suppress switch noise. It fulfils the CISPR noise regulation.

The fuse F401 protects PU I and the blower converter. Fuse F402 protects PU II. The diodes D401 and D402 protect against reverse polarity of the input voltage.

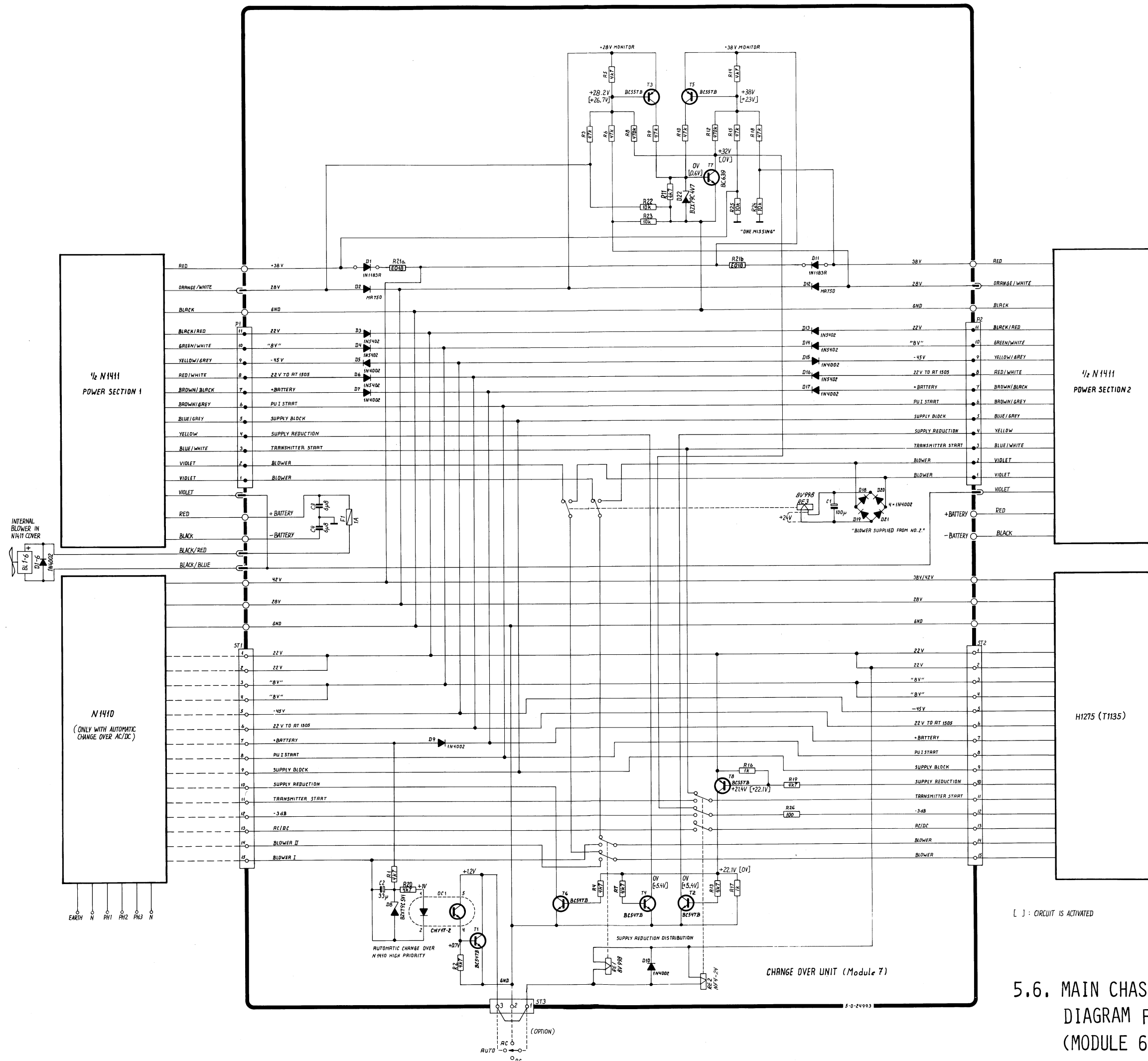


Seen from component side with lower side tracks



5.5. MAIN DIAGRAM 24VDC POWER SECTION AND CHASSIS FOR POWER SECTION (MODULE 5/500)





5.6. MAIN CHASSIS AND MAIN SCHEMATIC  
DIAGRAM FOR N1411  
(MODULE 6/600)

## 5.7. CHANGE-OVER UNIT (MODULE 7/700)

All output voltages are combined with diodes, which means that if one power section fails the other section takes over.

### **BLOWER CHANGE-OVER**

The blowers in T1135 are normally supplied from the blower converter in power section 2. If this blower converter should fail, the voltages, which are rectified in the diodes D18-D21 for the relay RE3, disappears and the blowers are then switched over to the blower converter in power section 1.

### **POWER SUPPLY CHANGE-OVER**

If the AC power supply in N1410 is connected to the Change-Over unit, a link in ST3 must be placed between terminal 1 and 3 to perform automatic change-over from AC to DC. The link can also be replaced by a switch connected as shown in the diagram. Then the changing-over can be controlled by the operator, who decides where the main power to the transmitter has to be delivered from. It can be from DC or from AC or automatic change-over from AC to DC, if AC fails. The switch has three positions.

In position AUTOMATIC, the opto coupler OC1 detects if there is any AC on the blower I wire, which indicates that AC mains is present. If AC is present, the OC1 turns on transistor T1, which again activates the relays RE1 and RE2. The blowers in T1135 are then connected to N1410 via RE1, and the control wires from T1135 to the power supply are switched over to N1410 via RE2. Only the PU I in both power sections in N1411 are running, ready to take over if N1410 fails. There should be no drop in voltage to the receiver and the exciter during the changing-over.

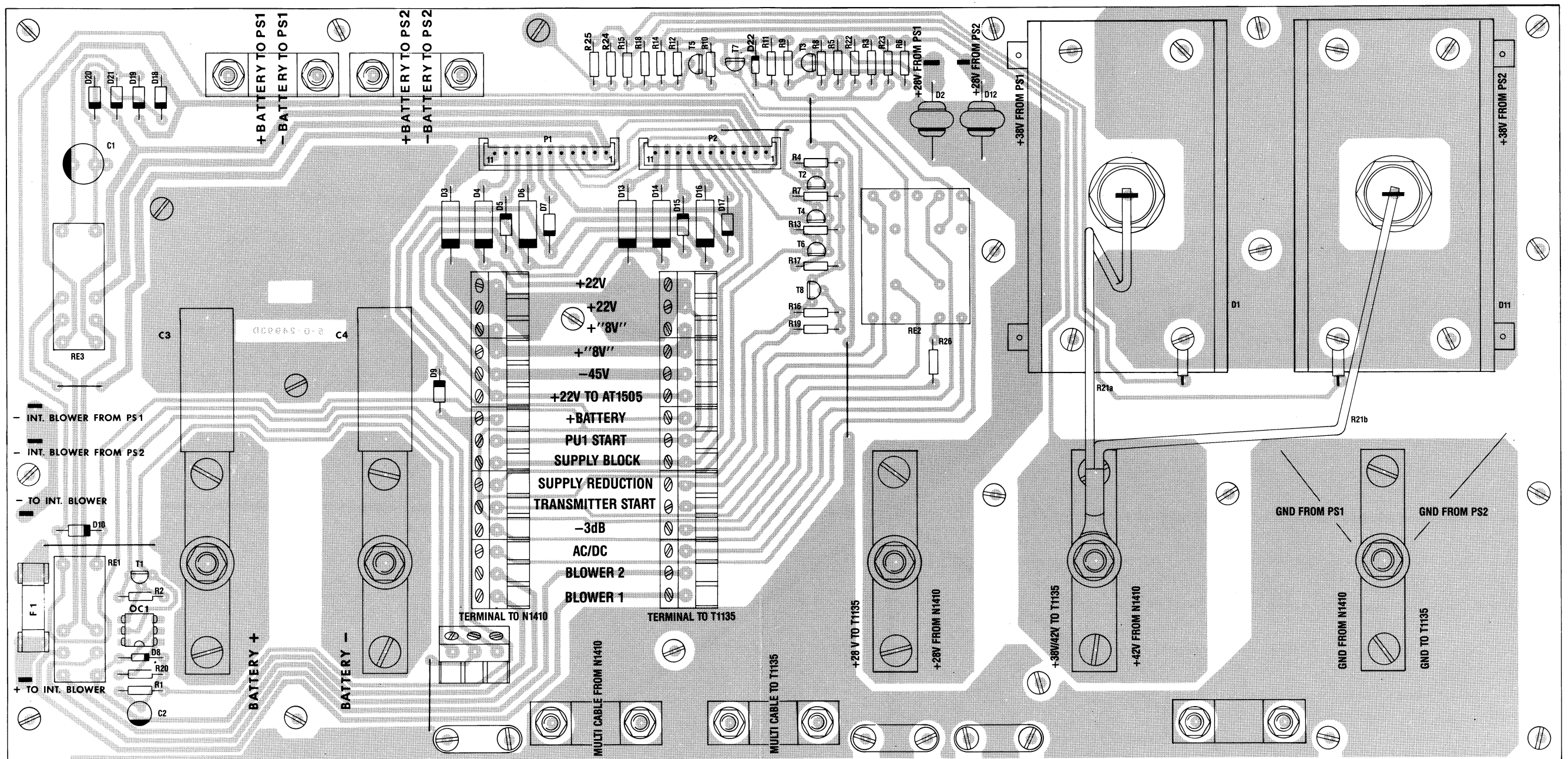
In position AC, the relays RE1 and RE2 are always activated. All control signals from T1135 are then connected to N1410, which delivers the main power to the transmitter. If the 42V output voltage has to be reduced, signal from T1135 activates the supply reduction circuit in N1410 via T2 and T8. In N1411 the PU I is still running, but delivers no power.

In position DC, the relays RE1 and RE2 cannot be activated by OC1. All the controls from T1135 are connected to N1411, which then delivers the main power to the transmitter.

### **MONITOR**

In position DC or AUTOMATIC, a monitor circuit is watching if one of the 28V or one of the 38V is missing. If one of the voltages is missing, T3 or T5 turns on. Transistor T7 is turned on too and pulls down the -3 dB wire to T1135, which again reduces the 38V output to approx. 30V via the transistors T4, T6, and T8.

In position DC or AUTOMATIC where the DC power supply is working, the AC/DC wire is lifted. This activates the transmitter to reduce its output power to 1000W PEP.



## CONTENTS

### 6. PARTS LIST

NI411 GRØN

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	DC POWER SUPPLY	N1411 (MODULE 6)	ESPERA	DC POWER SUPPLY
				801411
BL1-6	FAN 24VDC	125DH2TM21000	*ETRI	125 DH 2 TM 21000
-7	CHANGE OVER UNIT N1411	MODULE 7	ESPERA	5-0-24993D
PS1	DC POWER SUPPLY SECTION	N1411 (MODULE 5)	ESPERA	DC POWER SUPPLY N1411
PS2	DC POWER SUPPLY SECTION	N1411 (MODULE 5)	ESPERA	DC POWER SUPPLY N1411
D1-6	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
				25.100

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	DC POWER SUPPLY SECTION	N1411 (MODULE 5)	ESPERA	DC POWER SUPPLY N1411
				700800
-1	CAPACITOR UNIT	MODULE 1/100	ESPERA	PRINT NR.5-0-23224B
-2	POWER UNIT I & II	MODULE 200	ESPERA	PRINT NR 5-0-23061A
				TEST MODULE N1411
-3	BLOWER CONVERTER	MODULE 3/300	ESPERA	PRINT NR.5-0-23053A
-4	INPUT FILTER	MODULE 400	ESPERA	PRINT NR.5-0-23305A
C501	CAPACITOR MKC	0.47uF 10% 250V	ERO	MKC1860
C502	CAPACITOR MKC	0.47uF 10% 250V	ERO	MKC1860
C503	CAPACITOR ELECTROLYTIC	4700uF 40V	FRAGO	EBA
C504	CAPACITOR MKC	0.47uF 10% 250V	ERO	MKC1860
C505	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000
D501	DIODE BRIDGE	50V 6A	G.I.	KBPC6005
D502	DIODE BRIDGE	50V 6A	G.I.	KBPC6005
D503	DIODE ZENER	75V 5W	MOTOROLA	1N5374B
D504	DIODE ZENER	75V 5W	MOTOROLA	1N5374B
D505	DIODE BRIDGE	100V 35A	MOTOROLA	BYW61
L501	TRAFO	TD4573	TRADANIA	TD4573
L502	TRAFO	TD4573	TRADANIA	TD4573
L503	TRAFO	TD4240	TRADANIA	TD4240
L504	TRAFO	TD4573	TRADANIA	TD4573
R501	RESISTOR	220 OHM 10% 10W	*ARCOL	HS-10
R502	RESISTOR	2.7 OHM 5% 2.5W	PHILIPS	2322 192 32708
R503	RESISTOR	2.7 OHM 5% 2.5W	PHILIPS	2322 192 32708
R504	RESISTOR	2.7 OHM 5% 2.5W	PHILIPS	2322 192 32708
R505	RESISTOR	510V S14K50	SIEMENS	Q69-X3135
T501			ESPERA	SORT.TRANS.BUV 49/HJ 802
				I SET
T502			ESPERA	SORT.TRANS.BUV 49/HJ 802
				I SET
T504	TRANSISTOR (PAIR)	BUV19	ESPERA	708363 TRANS.BUV19 SET
T505	TRANSISTOR (PAIR)	BUV19	ESPERA	708363 TRANS.BUV19 SET
T506	TRANSISTOR	BD650	PHILIPS	BD650
T507	TRANSISTOR POWER	BD649	PHILIPS	BD649
T508	TRANSISTOR	BD650	PHILIPS	BD650
T509	TRANSISTOR POWER	BD649	PHILIPS	BD649
T510	TRANSISTOR	BDX34B	MOTOROLA	BDX34B
TB501	THERMAL BREAKER	OFF:100 ON:71	COMEPA	25 2 98 21 100 071
TB502	THERMAL BREAKER	OFF:88 ON:77	* COMEPA	25 2 98 21 088 077
				MARKED 910
TB503	THERMAL BREAKER	ON:70 OFF:55	* COMEPA	25 0 98 21 070 055
				MARKED 915
TR501	TRANSFORMER	TD 0532.0	TRADANIA	TD 0532.0
				22.507

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
TR502	TRANSFORMER	TD 0324	TRADANIA	TD0324
				22.108

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	CAPACITOR UNIT	MODULE 1/100	ESPERA	PRINT NR.5-0-23224B
				608337
C101	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EGD
C102	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EG 03 MG 422 G
C103	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EGD
C104	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EG 03 MG 422 G
C105	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EGD
C106	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 40V	ERO*	EG 03 MG 422 G
R101	RESISTOR	TL379	ESPERA	6-0-23757
				400379

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	POWER UNIT I & II	MODULE 200	ESPERA	PRINT NR 5-0-23061A
				TEST MODULE N1411
				6P8338
C201	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C202	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C203	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C204	CAPACITOR ELECTROLYTIC	22uF 20% 25V	ERO*	EKI 00 AA 222 E
C205	CAPACITOR MKT	0.1uF 10% 400V	ERO*	MKT1822
C206	CAPACITOR MKT	22nF 10% 400V	ERO*	MKT1822
C207	CAPACITOR MKT	330nF 10% 63V	ERO*	MKT1818
C208	CAPACITOR MKT	22nF 10% 400V	ERO*	MKT1822
C209	CAPACITOR ELECTROLYTIC	22uF 20% 25V	ERO*	EKI 00 AA 222 E
C210	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C211	CAPACITOR POLYESTER	0.22uF 10% 100V	ERO*	MKT1822
C212	CAPACITOR POLYESTER	0.22uF 10% 100V	ERO*	MKT1822
C213	CAPACITOR POLYESTER	0.22uF 10% 100V	ERO*	MKT1822
C214	CAPACITOR ELECTROLYTIC	470uF -20/+30% 63V	PHILIPS**	2222 035 68471
C215	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 16V	ERO	EKM 00 JG 422 D
C216	CAPACITOR ELECTROLYTIC	100uF -10/+50% 63V	ERO	EKM 00 DE 310 J
C217	CAPACITOR ELECTROLYTIC	10uF 20% 35V	ERO*	EKI 00 AA 210 F
C218	CAPACITOR MKT	47nF 10% 250V	SIEMENS	B32510-D3473-K000
C219	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C220	CAPACITOR ELECTROLYTIC	220uF -10/+50% 25V	ERO*	EKR
C221	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25V	ERO	EKM 00 CC 310 E
C222	CAPACITOR ELECTROLYTIC	220uF -10/+50% 25V	ERO*	EKR
C223	CAPACITOR ELECTROLYTIC	1000uF -10/+50% 25V	ERO	EKM 00 JG 410 E
C224	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z
C225	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z
C226	CAPACITOR MKT	1000nF 10% 100V	SIEMENS	B32511-D1105-K000
C227	CAPACITOR ELECTROLYTIC	10uF 20% 35V	ERO*	EKI 00 AA 210 F
C228	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C229	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000
C230	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000
C231	CAPACITOR ELECTROLYTIC	470uF -20/+30% 63V	PHILIPS**	2222 035 68471
C232	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000
C233	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000
C234	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000
D201	DIODE ZENER	12V	THOMSON-CSF	BZV47C12
D202	DIODE	BAV21	PHILIPS	BAV21
D203	DIODE	MR750	MOTOROLA	MR750
D204	DIODE	MR750	MOTOROLA	MR750
D205	DIODE BRIDGE	400VDC 1.5A	G.I.*	2KBP04
D206	DIODE ZENER	75V BZV47C75	THOMSON-CSF	BZV47C75

N1411/12-87

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
D207	DIODE ZENER	75V BZV47C75	THOMSON-CSF	BZV47C75	26.792
D208	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7	25.100
D209	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7	25.100
D210	DIODE F.REC	3A/50V	MOTOROLA*	MR850	25.225
D211	DIODE ZENER	2.7V BZX83C2V7	THOMSON-CSF	BZX83C2V7	26.606
D212	DIODE	BAV21	PHILIPS	BAV21	25.340
D213	DIODE ZENER	4.7V 5% 0.4W BZX79C4V7	PHILIPS*	BZX79C4V7	26.524
D214	DIODE F.REC	3A/50V	MOTOROLA*	MR850	25.225
D215	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D216	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7	25.100
IC201	INTEGRATED CIRCUIT	TDA4718A	SIEMENS	TDA4718A	31.490
IC202	INTEGRATED CIRCUIT	MC1723 CP	MOTOROLA*	MC1723CP	31.230
IC203	INTEGRATED CIRCUIT	MC1723 CP	MOTOROLA*	MC1723CP	31.230
IC204	INTEGRATED CIRCUIT	LM358N	TEXAS*	LM358 P	31.100
IC205	INTEGRATED CIRCUIT	MC1723 CP	MOTOROLA*	MC1723CP	31.230
IC206	VOLTAGE REGULATOR	8V 5% MC78L08ACP	MOTOROLA	MC78L08ACP 5% PL.HUS	31.138
OC201	OPTO-COUPLER	CNY17-2	TOSHIBA*	CNY 17-2	32.530
R201	RESISTOR	470 OHM 5% 2.5W	PHILIPS	2322 192 34701	04.691
R202	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R203	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R204	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R205	RESISTOR MF	1.8k OHM 5% 0.4W	* PHILIPS	2322 181 53182	01.206
R206	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R207	RESISTOR MF	1.5M OHM 5% 0.4W	* PHILIPS	2322 181 53155	01.279
R208	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R209	RESISTOR	1.5KOHM 5% 1.6W	PHILIPS	2322 191 31502	04.204
R210	RESISTOR	0.22 OHM 10% 4W	PHILIPS	2322 329 34227	05.618
R211	RESISTOR	0.22 OHM 10% 4W	PHILIPS	2322 329 34227	05.618
R212	RESISTOR	1.5KOHM 5% 1.6W	PHILIPS	2322 191 31502	04.204
R213	RESISTOR MF	100 OHM 5% 0.4W	* PHILIPS	2322 181 53101	01.175
R214	RESISTOR MF	100 OHM 5% 0.4W	* PHILIPS	2322 181 53101	01.175
R215	RESISTOR MF	1.8k OHM 5% 0.4W	* PHILIPS	2322 181 53182	01.206
R216	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R217	RESISTOR	1.5 KOHM 5% 0.6W	BEYSCHLAG	MBB 0207-00-BX-1K5 5%	03.204
R218	RESISTOR	1.5 KOHM 5% 0.6W	BEYSCHLAG	MBB 0207-00-BX-1K5 5%	03.204
R219	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R220	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R221	RESISTOR MF	150 OHM 5% 0.4W	* PHILIPS	2322 181 53151	01.179
R222	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R223	RESISTOR MF	2.7k OHM 5% 0.4W	* PHILIPS	2322 181 53272	01.210
R224	RESISTOR	27 OHM 5% 2.5W	PHILIPS	2322 192 32709	04.660
R225	RESISTOR	100 OHM 5% 2.5W	PHILIPS	2322 192 31001	04.675
R226	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R227	RESISTOR MF	1M OHM 5% 0.4W	* PHILIPS	2322 181 53105	01.275

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R228	RESISTOR MF	56 OHM 5% 0.4W	* PHILIPS	2322 181 53569	01.168
R229	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R230	RESISTOR MF	2.7k OHM 5% 0.4W	* PHILIPS	2322 181 53272	01.210
R231	RESISTOR	0.11 OHM 10% 5W	PHILIPS	2322 329 35117	05.616
R232	RESISTOR	0.11 OHM 10% 5W	PHILIPS	2322 329 35117	05.616
R233	RESISTOR	0.11 OHM 10% 5W	PHILIPS	2322 329 35117	05.616
R234	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R235	RESISTOR MF	680 OHM 5% 0.4W	* PHILIPS	2322 181 53681	01.195
R236	RESISTOR MF	8.2k OHM 5% 0.4W	* PHILIPS	2322 181 53822	01.222
R237	RESISTOR MF	2.7k OHM 5% 0.4W	* PHILIPS	2322 181 53272	01.210
R238	POTENTIOMETER TRIMMING	1 KOHM 20% 0.3W	NOBLE	TM8-KV2-1S	07.784
R239	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R240	RESISTOR MF	3.3k OHM 5% 0.4W	* PHILIPS	2322 181 53332	01.212
R241	POTENTIOMETER TRIMMING	10 KOHM 20% 0.3W	NOBLE*	TM8-KV2-1S	07.788
R242	RESISTOR MF	2.7k OHM 5% 0.4W	* PHILIPS	2322 181 53272	01.210
R243	POTENTIOMETER TRIMMING	10 KOHM 20% 0.3W	NOBLE*	TM8-KV2-1S	07.788
R244	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R245	RESISTOR MF	180 OHM 5% 0.4W	* PHILIPS	2322 181 53181	01.181
R246	RESISTOR MF	56k OHM 5% 0.4W	* PHILIPS	2322 181 53563	01.243
R247	RESISTOR MF	56k OHM 5% 0.4W	* PHILIPS	2322 181 53563	01.243
R248	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R249	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R250	RESISTOR MF	560k OHM 5% 0.4W	* PHILIPS	2322 181 53564	01.268
R251	RESISTOR MF	15k OHM 5% 0.4W	* PHILIPS	2322 181 53153	01.229
R252	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R253	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R254	RESISTOR MF	390 OHM 5% 0.4W	* PHILIPS	2322 181 53391	01.189
R255	RESISTOR MF	22 OHM 5% 0.4W	* PHILIPS	2322 181 53229	01.158
R256	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R257	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R258	RESISTOR MF	2.7k OHM 5% 0.4W	* PHILIPS	2322 181 53272	01.210
R259	POTENTIOMETER TRIMMING	4.7 KOHM 20% 0.3W	NOBLE	TM8-KV2-1S	07.787
R260	RESISTOR	56 OHM 5% 0.5W	PHILIPS	2322 156 15609	03.168
R261	RESISTOR MF	680 OHM 5% 0.4W	* PHILIPS	2322 181 53681	01.195
R262	RESISTOR MF	1M OHM 5% 0.4W	* PHILIPS	2322 181 53105	01.275
R263	RESISTOR MF	12k OHM 5% 0.4W	* PHILIPS	2322 181 53123	01.227
R264	RESISTOR MF	82k OHM 5% 0.4W	* PHILIPS	2322 181 53823	01.247
R265	RESISTOR MF	68k OHM 5% 0.4W	* PHILIPS	2322 181 53683	01.245
R266	RESISTOR MF	51k OHM 5% 0.4W	* PHILIPS	2322 181 53513	01.242
R267	RESISTOR MF	220 OHM 5% 0.4W	* PHILIPS	2322 181 53221	01.183
R268	RESISTOR	0.11 OHM 10% 5W	PHILIPS	2322 329 35117	05.616
R269	RESISTOR MF	470 OHM 5% 0.4W	* PHILIPS	2322 181 53471	01.191
R270	RESISTOR MF	3.9k OHM 5% 0.4W	* PHILIPS	2322 181 53392	01.214
R271	POTENTIOMETER TRIMMING	1 KOHM 20% 0.3W	NOBLE	TM8-KV2-1S	07.784

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P. NUMB
R272	RESISTOR MF	620 OHM 5% 0.4W	* PHILIPS	2322 181 53621	01.194
R273	RESISTOR MF	68k OHM 5% 0.4W	* PHILIPS	2322 181 53683	01.245
R274	RESISTOR	0.12 ohm 10% 3W	DANOTHERM	VC 3 0.12ohm 10%	05.120
R275	RESISTOR	150 OHM 5% 0.5W	DRALORIC	SMA0411050FA150R	01.379
				NOT PREFERRED	
R276	RESISTOR MF	15 OHM 5% 0.4W	* PHILIPS	2322 181 53159	01.154
RE201	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998	21.015
RE202	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998	21.015
RE203	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998	21.015
RE204	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998	21.015
RE205	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998	21.015
T201	TRANSISTOR	BD650	PHILIPS	BD650	29.088
T202	TRANSISTOR	BD650	PHILIPS	BD650	29.088
T203	TRANSISTOR	BDX34B	MOTOROLA	BDX34B	29.105
T204	TRANSISTOR	BD138	MOTOROLA*	BD138	29.057
T205	TRANSISTOR	BC640	PHILIPS	BC640	28.124
T206	TRANSISTOR	BC639	MOTOROLA*	BC639	28.120
T207	TRANSISTOR	BC338	PHILIPS	BC338	28.056
TR201	TRAFO	TD3435	TRADANIA	TD3435	22.142
TR202	TRAFO	TD4265	TRADANIA	TD4265	22.150
TR203	TRAFO	TD4265	TRADANIA	TD4265	22.150

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P. NUMB
	BLOWER CONVERTER	MODULE 3/300	ESPERA	PRINT NR.5-0-23053A	608336
C301	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C302	CAPACITOR ELECTROLYTIC	47uF 20% 25V	ERO*	EKI 00 BB 247 E	14.524
C303	CAPACITOR MKT	220nF 5% 63V	ERO	MKT1818	11.091
C304	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C305	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C306	CAPACITOR MKT	220nF 5% 63V	ERO	MKT1818	11.091
C307	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
D301	DIODE ZENER	12V	THOMSON-CSF	BZV47C12	26.750
D302	DIODE	1N4148	ITT*	1N4148	25.131
D303	DIODE	1N4148	ITT*	1N4148	25.131
D304	DIODE	1N4148	ITT*	1N4148	25.131
D305	DIODE	1N4148	ITT*	1N4148	25.131
D306	DIODE	BAV21	PHILIPS	BAV21	25.340
IC301	INTEGRATED CIRCUIT	MC1455P1	MOTOROLA*	MC1455P1	31.205
IC302	DUAL TYPE D FLIP-FLOP	MC14013BCP	SIGNETICS*	HEF4013BP	33.056
IC303	INTEGRATED CIRCUIT	MC1455P1	MOTOROLA*	MC1455P1	31.205
OC301	OPTO-COUPLER	CNY17-2	TOSHIBA*	CNY 17-2	32.530
R301	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R302	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R303	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R304	RESISTOR	1.5 KOHM 5% 0.6W	BEYSCHLAG	MBB 0207-00-BX-1K5 5%	03.204
R305	POTENTIOMETER TRIMMING	22 KOHM 20% 0.3W	NOBLE*	TM8-KV2-1S	07.792
R306	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R307	RESISTOR MF	5.6k OHM 5% 0.4W	* PHILIPS	2322 181 53562	01.218
R308	RESISTOR MF	100k OHM 5% 0.4W	* PHILIPS	2322 181 53104	01.250
R309	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R310	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R311	POTENTIOMETER TRIMMING	22 KOHM 20% 0.3W	NOBLE*	TM8-KV2-1S	07.792
R312	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R313	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R314	RESISTOR MF	3.3k OHM 5% 0.4W	* PHILIPS	2322 181 53332	01.212
R315	RESISTOR MF	8.2k OHM 5% 0.4W	* PHILIPS	2322 181 53822	01.222
R316	RESISTOR MF	470k OHM 5% 0.4W	* PHILIPS	2322 181 53474	01.266
R317	RESISTOR MF	8.2k OHM 5% 0.4W	* PHILIPS	2322 181 53822	01.222
R318	RESISTOR MF	470k OHM 5% 0.4W	* PHILIPS	2322 181 53474	01.266
R319	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R320	RESISTOR	470 OHM 5% 1.6W	PHILIPS	2322 191 34701	04.191
R321	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R322	RESISTOR	330 OHM 5% 2.5W	PHILIPS	2322 192 33301	04.687
R323	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R324	RESISTOR	470 OHM 5% 1.6W	PHILIPS	2322 191 34701	04.191



POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R325	RESISTOR MF	1k 0HM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
T301	TRANSISTOR	BC338	PHILIPS	BC338	28.056
T302	TRANSISTOR	BC338	PHILIPS	BC338	28.056
T303	TRANSISTOR	BC548	ITT*	BC548	28.070
				A/B/C	
T304	TRANSISTOR	MPS A06	MOTOROLA#	MPS-A06	28.410
T305	TRANSISTOR	MPS A06	MOTOROLA#	MPS-A06	28.410

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
	INPUT FILTER	MODULE 400	ESPERA	PRINT NR.5-0-23305A	600888
C401	CAPACITOR MKT	2.2uF 10% 100V	SIEMENS	B32512-E1225-K000	11.406
C402	CAPACITOR MKT	2.2uF 10% 100V	SIEMENS	B32512-E1225-K000	11.406
C409	CAPACITOR ELECTROLYTIC	2200uF-10/+50% 40V	ERO*	EG 00 MG 422 G	14.720
C410	CAPACITOR ELECTROLYTIC	2200uF-10/+50% 40V	ERO*	EG 00 MG 422 G	14.720
C411	CAPACITOR ELECTROLYTIC	100uF -10/+50% 63V	ERO	EB 00 GD 310 J	14.562
D401	DIODE	MR750	MOTOROLA	MR750	25.219
D402	DIODE	MR750	MOTOROLA	MR750	25.219
F401	FUSE	10A M Ø6.3x32mm	WICKMANN	311010	45.634
F402	FUSE	35A M Ø6.3x32mm	WICKMANN	311035	45.636
L401	COIL	TL354	BB	6-0-23495A	400354

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
CHANGE OVER UNIT N1411		MODULE 7	ESPERA	5-0-24993D
				600802
-7	PLUG (MALE)	11 POLE	AMP	1-826375-1
C1-7	CAPACITOR ELECTROLYTIC	100uF -10/+50% 40V	ERO	EKM 00 DD 310 G
C2-7	CAPACITOR ELECTROLYTIC	33uF 20% 35V	ERO	EKI 00 BB 233 F
C3-7	CAPACITOR MKT	6.8uF 10% 100V	ERO*	MKT1822
C4-7	CAPACITOR MKT	6.8uF 10% 100V	ERO*	MKT1822
D1-7	DIODE POWER RECTIFIER	35A 100VDC	MOTOROLA	1N1184R INCL.HARDWARE
D2-7	DIODE	MR750	MOTOROLA	MR750
D3-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D4-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D5-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D6-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D7-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D8-7	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS*	BZX79C5V1
D9-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D10-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D11-7	DIODE POWER RECTIFIER	35A 100VDC	MOTOROLA	1N1184R INCL.HARDWARE
D12-7	DIODE	MR750	MOTOROLA	MR750
D13-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D14-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D15-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D16-7	DIODE REC.	1N5402 200V/3A	PROMAX*	1N5402
D17-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D18-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D19-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D20-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D21-7	DIODE	1N4002	ITT*	1N4001/2/3/4/5/6/7
D22-7	DIODE ZENER	4.7V 5% 0.4W BZX79C4V7	PHILIPS*	BZX79C4V7
F1-7			ELU	17200001000
OC1-7	OPTO-COUPLER	CNY17-2	TOSHIBA*	CNY 17-2
R1-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R2-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R3-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R4-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R5-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R6-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R7-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R8-7	RESISTOR MF	470k OHM 5% 0.4W	* PHILIPS	2322 181 53474
R9-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R10-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R11-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R12-7	RESISTOR MF	470k OHM 5% 0.4W	* PHILIPS	2322 181 53474

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
R13-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R14-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R15-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R16-7	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102
R17-7	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102
R18-7	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473
R19-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R20-7	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472
R21-7	RESISTOR	TL462	ESPERA	6-0-25091A
R22-7	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103
R23-7	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103
R24-7	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103
R25-7	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103
R26-7	RESISTOR MF	100 OHM 5% 0.4W	* PHILIPS	2322 181 53101
RE1-7	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998
RE2-7	RELAY	24V DC 2A 4 SK	MEW	NF4-24VDC
RE3-7	RELAY	24V DC 10A 2 SK	PASI	KS/U-3-C BV998
T1-7	TRANSISTOR	BC547B	ITT*	BC547B
T2-7	TRANSISTOR	BC547B	ITT*	BC547B
T3-7	TRANSISTOR	BC557B	ITT*	BC557B
T4-7	TRANSISTOR	BC547B	ITT*	BC547B
T5-7	TRANSISTOR	BC557B	ITT*	BC557B
T6-7	TRANSISTOR	BC547B	ITT*	BC547B
T7-7	TRANSISTOR	BC639	MOTOROLA*	BC639
T8-7	TRANSISTOR	BC557B	ITT*	BC557B